

The Hygrophoraceae of Tasmania

A.M. Young^{1,3} and A.K. Mills²

¹ Hon. Assoc., Queensland Herbarium, Brisbane Botanic Gardens Mt Coot-tha, Mt Coot-tha Rd, Toowong, Qld, 4066

² 50 Patons Rd, Penguin, Tas. 7316

³ Author for correspondence: *Bee Cottage*, Langton Rd, Blackbutt, Qld 4306. tyoung@bigpond.com

Abstract

Twenty-six taxa of Tasmanian Hygrophoraceae are listed or described. New taxa are: *Hygrocybe franklinensis* A.M.Young & A.K.Mills, *Hygrocybe roseoflavida* A.M.Young & A.K.Mills and *Hygrophorus involutus* var. *albus* A.M.Young & A.K.Mills. Full descriptions and diagrams are provided where necessary for all new taxa. Previously described taxa found in Tasmania are listed together with details of any new information and all known herbarium collections for the Tasmanian species. Keys to the species are included.

Introduction

Little has been published on the Hygrophoraceae of Tasmania other than as minor inclusions in publications that relate to other mycological or botanical investigations. Masee (1899) described the new species *Hygrophorus rodwayi* Masee from a location near Hobart but further information on Tasmanian Hygrophoraceae was not published for a little over 90 years. Young and Wood (1997) commented on the probable richness of the Tasmanian flora within family Hygrophoraceae as suggested by the work of Monks (1989) while Young (2000a) indicated that Tasmanian collections had recently been made of both *Hygrocybe rodwayi* (Masee) A.M.Young and *H. lewellinae* (Kalchbr.) Brittleb. ex A.M.Young.

A recent paper dealing solely with the Tasmanian Hygrophoraceae is that of Monks and Mills (1991) who provided a more concise description of *Camarophyllus rodwayi* (Masee) Monks & A.K.Mills. This was followed by the description of the new species *Hygrocybe erythrorenata* Monks & A.K.Mills and the demonstration of coloured spore prints for both this new species and *Hygrocybe lilaceolamellata* (G.Stev.) E.Horak (Mills & Monks 1993). A small but very beautiful collection of coloured photographs of Tasmanian Hygrophoraceae is contained in the booklet on Tasmanian rainforest fungi (Fuhrer & Robinson 1992). Unfortunately, little other information is provided, however many of the 16 taxa depicted are easily recognisable, excellent definitive illustrations for these species are provided, and are cited as such within this paper.

There is no longer any doubt as to the large number of species of Hygrophoraceae in Tasmania; however this paper should be considered only as a preliminary survey of the Tasmanian taxa. Although three new taxa are described, the paper's principal aim is to provide a foundation for future studies on the Tasmanian Hygrophoraceae by providing a census of previously described taxa that occur in Tasmania together with any pertinent data. Collections made by both authors during the seasons of 1998 and 1999 indicate that a considerable number of taxa remain to be formally described.

The Tasmanian species of Hygrophoraceae differ considerably in known habitat when compared to the mainland flora. Mainland taxa are found in a wide variety of habitats which include grassland, heath, dry sclerophyll woodland, dry and wet sclerophyll forest, various forms of rainforest and beech forest (*Nothofagus* spp.). This is not the case for Tasmanian taxa which are almost exclusively found in cool temperate rainforests that are usually dominated by *Nothofagus cunninghamii* (southern beech) and *Artherosperma moschatum* (sassafras) with an under-story of tree ferns (*Cyathea* and *Dicksonia* spp.).

The floors of these forests contain not only abundant, moist litter, but also immense carpets of moss, and the combination of these two substrates (together with the conditions of temperature and humidity maintained under the forest canopy) seems to be particularly suitable for the fruiting of species of Hygrophoraceae. Assuming the normal seasonal rainfall, some species commence to produce fruiting bodies in early April but a maximum of both species fruiting and basidiomes produced by each species occurs during May and early June. Some species continue to produce considerable numbers of fruiting bodies in July and a few species may still produce scattered basidiomes as late as mid-August.

Two instances where taxa occurred outside the cool temperate rainforest were noted during 1999 when *Hygrocybe cantharellus* (Schwein.) Murrill was collected from amongst moss in heath and a small collection of an undescribed species of *Hygrocybe* was found on a moss bank beside a path in coastal eucalypt forest. Extensive collecting by the second author has demonstrated that when taxa of Hygrophoraceae have been collected in the Tasmanian wet sclerophyll forests (dominated by *Eucalyptus* spp.), then the collection sites are marginal zones where cool temperate rainforest tree species intermingle with the wet sclerophyll forest species. There are no known collections of Tasmanian Hygrophoraceae from that state's dry sclerophyll forests and only a single collection from pasture is here recorded.

Generally, the basidiomes of species as they occur in Tasmania, have characteristics which conform very closely to the known characters of the taxa as they occur on the Australian mainland, however they do occasionally differ. Spore sizes in some Tasmanian Hygrophoraceae are sometimes larger than those of either or both the holotype or the Australian mainland representatives of the respective species. This is true for the taxa *Hygrocybe cheelii* A.M.Young and *Hygrocybe irrigata* (Pers.: Fr.) Bon. Other microscopic differences observed include much longer basidia in basidiomes of material currently accepted as *Hygrocybe stevensoniae* T.W.May & A.E.Wood and spore shape variations in both *Hygrocybe rodwayi* and *Hygrocybe astatogala* (R.Heim) Heinem.

Biogeographically, the Tasmanian species of Hygrophoraceae also show relationships with the Hygrophoraceae of New Zealand. A number of taxa occur in both geographical locations and New Zealand is the holotype location for several species. Links with South America are less well defined, however the species *Hygrocybe reesiaae* A.M.Young is undoubtedly related to the South American taxon *Camarophyllus adonis* Singer. Several taxa such as *Hygrocybe cantharellus* and *H. miniata* (Fr.: Fr.) P.Kumm. are cosmopolitan, although first described from Europe, but others such as *H. astatogala* have tropical distributions.

Materials and Methods

All material collected in Tasmania during 1998–1999 was air dried and preserved for later microscopic examination. Field notes were made from the fresh material and the accompanying colour codes refer to Kernerup and Wanscher (1981). Photographic slides were made either in the field or in the laboratory. The 1998–1999 material collected by the first author forms the basis for this paper supplemented with material from the second author's herbarium. Distribution notes for each taxon are limited to Tasmania, however many of the taxa occur on the Australian mainland and in New Zealand.

The Tasmanian material (other than holotypes) cited from the 1998–1999 collections has been deposited in either the Queensland State Herbarium (BRI) or the National Herbarium of Victoria (MEL). Holotype collections and all cited material from the Mills collection have been deposited in the Tasmanian Herbarium (HO). Collection numbers from each author's personal herbarium (cited as 'hb. Young' and 'hb. Mills' respectively) are provided for reference purposes. Material was also studied from AD, K, MICH, PDD, UNSW, ZT (Holmgren *et al.* 1990). Material in collections with ZT numbers has been divided: part remains in ZT and part is in BRI.

All microscope work was done on an Olympus CX40 binocular microscope with drawing tube attachment. The drawing tube was calibrated to provide scale drawings using an Olympus standard 1 mm slide. Material intended for microscopic analysis was rehydrated in ammoniated congo-red and gently warmed if necessary.

Illustrations are provided for the new taxa and for those species which are either not illustrated in previous papers (Young & Wood 1997; Young 1999; Young 2000a; Young *et al.* 2000) or which require additional diagrams as a result of new information. The habit-sketch shows basidiome dimensions. The microstructures of the pileus, hymenophoral trama and stipe are not depicted because they conform to standard forms (Young & Wood 1997). For each illustrated specimen, 20 spores and 10 basidia were selected at random, drawn and measured. The derived parameter 'Q' is defined as the quotient of the length divided by the width of the relevant spore or basidium; the mean 'Q' is the quotient of the mean length and width respectively.

This paper lists several species of Hygrophoraceae originally collected and described from Europe that are stated to have no type (Boertmann *pers. com.*). This problem has already been addressed (Young 2000a) and where types for European taxa do not exist, the species concepts of Boertmann (1995) are used.

Taxonomy

Family **Hygrophoraceae** Lotsy, *Vortr. Bot. Stammesg.* 1: 706 (1907). *Typical genus: Hygrophorus* Fr.

Basidiome small to medium sized, stipitate. *Pileus* conical, convex, umbilicate or infundibuliform; sometimes perforate; surface dry, moist, viscid or glutinous, smooth to squamulose or fibrillose. *Lamellae* generally thick, waxy, and distant; free or adnexed to decurrent. *Stipe* central, often brittle, with similar surface moisture or structures to pileus. *Universal veil* generally absent. *Context* soft, frequently thin, waxy and translucent. *Spore print* white, cream, pale violaceous or magenta. *Spores* small to large, subglobose to ovoid, ellipsoid or cylindrical, sometimes constricted, smooth, more rarely nodulose or echinulate, hyaline or rarely with dark contents, inamyloid rarely amyloid. *Basidia* often long and narrow. *Cheilocystidia* sometimes present, pleurocystidia rare and then as pseudo-pleurocystidia. *Hymenophoral trama* regular, irregular or bilateral. *Pileipellis* a cutis, trichoderm, ixocutis or ixotrichoderm, rarely a hymeniderm or epithelium. *Clamp connections* present or absent. Development gymnocarpic, occasionally hemiangiocarpic. Terrestrial, rarely lignicolous, mycorrhizal or saprobic.

Key to the tribes of Hygrophoraceae

1. Lamellae with regular to irregular trama, never divergent **Tribe 1. Hygrocybeae**
1. Lamellae with divergent trama **Tribe 2. Hygrophoreae**

TRIBE 1. HYGROCYBEAE Kühner, *Bull. mens. Soc. linn. Lyon* 48: 621 (1979). *Typical genus: Hygrocybe* (Fr.) P.Kumm.

Hymenophoral trama regular to irregular; not forming ectomycorrhizae.

Key to the genera of Hygrocybeae

1. Pileipellis composed of hyphae forming a cutis, ixocutis, trichoderm or ixotrichoderm of non-inflated, hyphal elements **Genus 1. Hygrocybe**
1. Pileipellis an hymeniderm but sometimes approaching an epithelium and then composed of inflated elements (one species known for Tasmania) **Genus 2. Camarophyllopsis**

GENUS 1. *HYGROCYPBE* (Fr.) P.Kumm., *Führ. Pilzk.*: 26 (1871); *Hygrocybe* Fr., *Syst. Mycol.* 1: 101 (1821); *Camarophyllus* Fr., *Syst. Mycol.* 1: 98 (1821); *Camarophyllus* (Fr.) P.Kumm., *Führ. Pilzk.*: 2 (1871). *Typical species: Agaricus conicus* Schaeff., *Fungi Bavariae* 4: 2 (1774).

Basidiome fleshy, often watery or waxy in texture, collybioid, mycenoid or omphaloid, generally small to medium sized but occasionally large; variously coloured, often bright red, orange, yellow, green and lilac or combinations of these colours. *Pileus* opaque or hygrophanous, striate or not, dry to glutinous, smooth to squamulose or fibrillose. *Lamellae* usually sub-distant to distant, free to adnate or decurrent, thick to very thick and with waxy appearance when fresh; velar structures absent. *Universal veil* absent. *Stipe* dry to glutinous, smooth to squamulose or fibrillose; spore print white, cream coloured, pale magenta or pale lilac. *Spores* hyaline, smooth or rarely spinose, non-amyloid (for known Australian taxa). *Basidia* sometimes long (50–70 µm), Q: 2.5–10.0, 2- and 4-spored forms frequent, clamp connections usually present. *Cheilocystidia* present in some species either as true or pseudo-cheilocystidia. *Pleurocystidia* very rare and then as pseudo-pleurocystidia. *Hymenophoral trama* regular, subregular to irregular, tramal elements from very long (> 1000 µm) to very short (< 30 µm); clamp connections usually present. *Pileipellis* a cutis, ixocutis, trichoderm or ixotrichoderm. Development gymnocarpic and stipitocarpic.

Habitat and Distribution: Solitary to gregarious, terrestrial, soil, humus or moss, rarely on rotten wood; found in various ecosystems from grasslands to forest and considered to be saprobic. Cosmopolitan from subarctic or subantarctic to tropics and alpine regions.

Key to the subgenera of *Hygrocybe*

1. Hymenophoral trama irregular, composed of short (20–150 µm) interwoven hyphal elements; basidiome colours often subdued (white, brown, dull lilac-grey) but may be orange, apricot or bright lilac; lamellae arcuate to decurrent; clamps present, occasionally rare in the hymenophoral trama**subgen. 1. *Cuphophyllus* Key 1.**
1. Hymenophoral trama regular to subregular (if subregular, then basidiome brightly coloured) and composed of parallel hyphal elements which are either 'long tubular' or chains of short elements; basidiome often very brightly coloured (red, orange, yellow, green, lilac); lamellae variously attached; clamps present, at least at the bases of the basidia2
- 2(1). Hymenophoral trama very regular, composed of very long (1000–3000 µm), aseptate, parallel, tubular elements with tapered ends; lamellae free, ascending or narrowly adnate; tissues may blacken on bruising; basidia usually short (mean length 30–40 (45) µm); except for the aseptate hymenophoral trama, clamps usually present throughout the basidiome, rarely absent in some taxa with 2-spored basidia (one species known for Tasmania)**subgen. 2. *Hygrocybe***
2. Hymenophoral trama regular to subregular, composed of parallel chains of short, sometimes inflated hyphal elements (usually 20–400 µm); lamellae more or less free to adnate or arto decurrent; tissues never blackening on bruising; basidia sometimes long (40–60 µm); clamps either present throughout the basidiome or present only at the bases of the basidia3
- 3(2). Clamps present throughout the basidiome and of medallion form or not**subgen. 3. *Pseudohygrocybe* Key 2.**
3. Clamps absent throughout the basidiome except at the bases of the basidia and then frequently of medallion form.....**subgen. 4 *Humidicutis* Key 3.**

Key 1: Tasmanian species of subgenus Cuphophyllus

1. Pileus off-white to cream coloured and often with biscuit brown tints at the depressed centre **4. *H. rodwayi***
1. Pileus yellow, yellow-orange or some shade of lilac or pinkish lilac 2
- 2(1). Pileus yellow or yellow-orange **1. *H. aurantiopallens***
2. Pileus a shade of lilac to pinkish lilac 3
- 3(2). Pileus lilac to greyish lilac, hygrophanous; margins not involute when juvenile; stipe base lilac **3. *H. reesiae***
3. Pileus bright pinkish lilac, not hygrophanous; pileus margins involute when juvenile; stipe base yellow **2. *H. cheelii***

Key 2: Species of subgenus Pseudohygrocybe

1. Pileus glutinous to viscid and pileipellis always an ixotrichoderm 2
1. Pileus dry and pileipellis a cutis or trichoderm, or viscid and pileipellis an ixocutis 7
- 2(1). Pileus white or yellow 3
2. Pileus green, a shade of brown or grey 4
- 3(2). Pileus and stipe white; lamellae adnexed to narrowly adnate **15. *H. leucogloea***
3. Pileus and stipe yellow; lamellae decurrent **8. *H. chromolimonea***
- 4(2). Lamellae margins fertile and without a gluten thread; hyphal cheilocystidia absent 5
4. Lamellae margins sterile and with a gluten thread; hyphal cheilocystidia present 6
- 5(4). Pileus green **20. *H. stevensoniae***
5. Pileus grey to grey-brown **13. *H. irrigata***
- 6(4). Pileus green, lamellae green; spores $8.5\text{--}10.5 \times 5\text{--}8 \mu\text{m}$; dried material dull green **18. *H. pseudograminicolor***
6. Pileus green to brown, lamellae white or white with green or brownish tints; spores $5.5\text{--}7.5 \times 3.5\text{--}5 \mu\text{m}$; dried material brick-pink **12. *H. graminicolor***
- 7(1). Spores dimorphic; macrospores $11\text{--}18 \mu\text{m}$ long **10. *H. firma***
7. Spores monomorphic; spores $< 11 \mu\text{m}$ long 8
- 8(7). Pileipellis a trichoderm (at least at the centre) 9
8. Pileipellis a cutis or ixocutis 10
- 9(8). Lamellae deeply decurrent, cream coloured to yellowish **7. *H. cantharellus***
9. Lamellae broadly adnate with at most a decurrent tooth, yellow with pink flush **17. *H. miniata***
- 10(8). Pileus viscid; pileipellis an ixocutis 11
10. Pileus dry; pileipellis a cutis 13
- 11(10). Pileus conical; lamellae narrowly adnate to ascending-adnate **11. *H. franklinensis***
11. Pileus convex; lamellae arcuate to decurrent 12
- 12(11). Lamellae pallid pink; stipe base yellow **19. *H. roseoflavida***
12. Lamellae cream-coloured; stipe base orange-red or red **6a. *H. anomala* var. *anomala***
- 13(10). Stipe yellow **14. *H. julietae***
13. Stipe red, orange or brown 14
- 14(13). Pileus and stipe brown, stipe base usually mauve tinted **16. *H. lilaceolamellata***
14. Pileus red to red-brown or orange-brown, stipe red to reddish orange, stipe base concolorous 15
- 15(14). Lamellae delicately tinted mauve or lilac; spinose spores always present **6a. *H. anomala* var. *ianthinomarginata***
15. Lamellae white, pinkish white, reddish grey or lilac red; spinose spores absent **9. *H. erythrocrenata***

Key 3: Species of subgenus *Humidicutis*

1. Basidiomes wholly white22. *H. mavis*
 1. Basidiomes wholly pale lilac to violet21. *H. lewellinae*

Species Information and Descriptions

Subgenus 1 *Cuphophyllus* Donk, *Beih. Nova Hedwigia* 5: 45 (1962). *Typical species:* *Agaricus pratensis* Pers.: Fr. [= *Camarophyllus pratensis* (Pers.: Fr.) P.Kumm.]

Basidiome dull coloured or rarely with bright colours in apricots, pinks or lilac to mauve; *lamellae* mostly decurrent; *hymenophoral trama* irregular; cystidia mostly absent; clamp connections frequent throughout the basidiome.

1. *Hygrocybe aurantiopallens* (E.Horak) A.M.Young in Young & Wood, *Austral. Syst. Bot.* 10: 921 (1997). *Camarophyllus aurantiopallens* E.Horak, *Beih. Nova Hedwigia* 43: 122 (1973). *Type:* New Zealand, Lake Rotoiti, 29.iv.1968, *E.Horak s.n.* (holotype PDD 27088).

Misappl.: *Hygrophorus aurantius* Murrill *sensu* G.Stev., *Kew Bull.* 16: 382 (1963).
Illustrations: Fuhrer & Robinson (1992), p. 38; Young & Wood (1997), p. 922.

Habitat and distribution: gregarious on soil amongst litter in cool temperate rainforest, often at the bases of tree ferns. The species is widespread in southern, central and north-western Tasmania.

Material: Mt Field National Park, 30.iv.1998, *A.M.Young* (*hb. Young 1974*; BRI); Julius River, 6.v.1998, *A.M.Young* (*hb. Young 1985*; BRI); Milkshake Reserve, 6.v.1998, *A.M.Young* (*hb. Young 1993*; BRI); Franklin R., 7.v.1998, *A.M.Young* (*hb. Young 2001*; BRI); Tahune, 27.iv.1998, *A.M.Young* (*hb. Young 1961*; MEL 2087780); Tahune, 11.v.1998, *A.M.Young* (*hb. Young 2012*; MEL 2087777); Growlingswallow nr Mt Field, 19.v.1999, *A.M.Young* (*hb. Young 2227*; MEL 2087772); Franklin R., 21.v.1999, *A.M.Young* (*hb. Young 2241*; MEL 2087769); Cradle Mt, 3.vi.1992, *T.W.May s.n.* (MEL 259607); Arve Loop Rd nr Geeveston, iv.1998, *A.K.Mills* (*hb. Mills 1510*; HO 508592).

Remarks: Basidiomes of *Hygrocybe aurantiopallens* can vary in their colouration from brilliant orange to orange-yellow or apricot-yellow. Young (1999) noted the probable misidentification of Fuhrer and Robinson (1992) of a specimen considered to be *Camarophyllus apricosa* (E.Horak) E.Horak. No Tasmanian material has yet been found which can be assigned to *C. apricosa* which has a conical pileus and distinctly ellipsoid spores. The misapplication of *Hygrophorus aurantius* Murrill by G. Stevenson is covered by Horak (1990), p. 278.

2. *Hygrocybe cheelii* A.M.Young, *Austrobaileya* 5: 547 (1999). *Type:* New South Wales. Gladesville, 17.vi.1916, *J.B.Cleland, s.n.* (holotype AD 3418).

Cantharellus lilacinus Cleland & Cheel, *Trans. & Proc. Roy. Soc. S. Australia* 43: 271 (1919). *Type:* New South Wales. Gladesville. 17.vi.1916. *J.B.Cleland, s.n.* (holotype AD 3418). *Camarophyllus lilacinus* (Cleland & Cheel) E.Horak, *New Zealand J. Bot.* 28: 203 (1990); *non Hygrocybe lilacina* (C.Laest. ex P.Karst.) M.Moser, *Die Röhrlinge und Blätterpilze (Agaricales)* 3 ed., 64 (1967).

Illustrations: Young (1999), p. 547; Willis (1963), plate 9, fig.1 as *Cantharellus lilacinus*; Cleland & Cheel (1919), Plate 29, fig.1.

Habitat and distribution: gregarious on soil amongst leaf litter or moss in cool temperate rainforest; occasionally in pasture grass. *Hygrocybe cheelii* is widespread and frequent in southern and central Tasmania.

Material examined: Sandspit Forest Reserve nr Wielangta, 27.ix.1997, *G.Gates* (*hb. Mills 1595*; HO 508608); Growlingswallet nr Mt Field, 1.x.1998, *A.K.Mills* (*hb. Mills 1596*; HO 508609); Growlingswallet nr Mt Field, 1.x.1998, *A.K.Mills* (*hb. Mills 1597*; HO 508610); Marion Bay nr Dunally, 5.vi.1999, *G.Gates* (*hb. Mills 1649*; HO 508615; MEL 2087782); Jacksons Bend, 14.x.1998, *G.Gates* (*hb. Mills 1602*; HO 508571).

Notes: These are the first collections from Tasmania assigned to this taxon. The spores of these collections measure $(6.5-8-10(-10.5) \times (5.5-6-6.5(-8)) \mu\text{m}$, mean range $8.3-9.1 \times 6.3-6.6 \mu\text{m}$, Q: 1.1-1.6(-1.8), range of mean Q: 1.31-1.45 and are somewhat larger than those of the holotype which measure $6-8.5 \times 4.5-6 \mu\text{m}$, mean $7.2 \times 5 \mu\text{m}$, Q: 1.2-1.7, mean Q: 1.43 although they have more or less the same dimension ratio as indicated by the similarity of the two sets of Q measurements. The basidia have no significant dimensional differences. It is interesting to note however, that a collection of *H. cheelii* from Victoria (Young 2000c) has spores measuring $7-10 \times 4.5-5.5(-6.5) \mu\text{m}$, mean $8.4 \times 5.4 \mu\text{m}$, Q: 1.3-1.8, mean Q: 1.56. One possible hypothesis is that spore size increases with latitude, but more collections of the taxon will be required to confirm this. It may also be that the larger spores found in the Victorian and Tasmanian collections are 'normal' while the smaller spores of the holotype represent a taxon variety with unusually small spores.

Collection *hb. Mills 1649* is of interest as it contains a collection in which most of the basidia are 2-spored and only very occasional basidia are 1-, 3- or 4-spored. Clamps are absent or extremely rare throughout the basidiome and only a single clamp connection was sighted in cuticular tissues during the examination. Similar clampless basidiomes where the basidia are predominantly 2-spored are well known in the Hygrophoraceae (Boertmann 1995; Young 2000a).

3. *Hygrocybe reesiae* A.M.Young in Young & Wood, *Austral. Syst. Bot.* 10: 923 (1997). *Type:* New South Wales. Lane Cove Bushland Park, 17.vi.1990, *R.Kearney & B.Rees s.n.* (holotype UNSW 90/205).

Illustration: Young & Wood (1997), p. 924.

Habitat and distribution: gregarious on leaf mould in cool temperate rainforest; frequently amongst moss or litter. The species is frequent in southern and central Tasmania.

Material: Arve Loop Rd nr Geeveston, 11.v.1998, *B.Rees* (*hb. Young 2016*; BRI); Mt Field, 24.iv.1997, *A.K.Mills* (*hb. Mills 1456*; HO 508586); Mt Field, 24.iv.1997, *A.K.Mills* (*hb. Mills 1460*; HO 508589); *Location and date unknown*; *A.J.Monks* (ZT 4574; BRI); Mt Field, 16.iv.1991, *E.Horak* (ZT 4350; BRI).

Remarks: *Hygrocybe reesiae* is at first bright lilac with a hygrophanous pileus. As drying proceeds, the lilac colour becomes fainter and the pileus surface changes to a lilac tinted buff. There is never a distinctly yellow stem base as occurs in *H. cheelii*. Some Tasmanian collections have exhibited a tendency to produce more ellipsoid spores with very few subglobose spores. As a result, spore measurements remain very similar to those of the holotype, but Q's are greater (1.4-1.7, mean 1.48) when compared to those of the holotype (1.1-1.5, mean 1.3). There are no other major differences. There is no doubt that *H. reesiae* is very closely related to the South American taxon *Camarophyllus adonis*, and both taxa almost certainly have a common ancestry. Basidiomes of *C. adonis* have spores which measure $6-9 \times 4.5-6.5 \mu\text{m}$ and basidia which measure $40-60 \times 5-7 \mu\text{m}$ (Horak 1979) and these dimensions are almost identical to those found in basidiomes of *H. reesiae*. *Camarophyllus adonis* has a robust basidiome, branching lamellae which are at most lilac tinted and a stipe which is whitish, yellowish or earthy brown; basidiomes of *H. reesiae* are more slender, have simple lamellae which are bright lilac or violet and violet coloured stipes which dry slowly to buff. Future genetic analysis may show that *H. reesiae* is the Australian variant of *C. adonis* but until this is done, the geographical and

macrocharacter differences of the two taxa are considered sufficient reasons to maintain the separation of the two species.

4. *Hygrocybe rodwayi* (Masse) A.M.Young in Young & Wood, *Austral. Syst. Bot.* 10: 923 (1997); *Hygrophorus rodwayi* Masee, *Bull. Misc. Inf. Kew* 1899: 178 (1899). *Camarophyllus rodwayi* (Masee) A.J.Monks & A.K.Mills in Banks *et al.* (eds), *Aspects of Tasmanian Botany – A Tribute to Winifred Curtis* 13 (1991). Type: Tasmania. Kingston Rd (nr Hobart), undated, *L.Rodway 137* (holotype K).

Illustrations: Fuhrer & Robinson (1992), p. 39; Young & Wood (1997), p. 925.

Habitat and distribution: gregarious to caespitose amongst moss or on soil amongst litter in cool temperate rainforest. *Hygrocybe rodwayi* is common in southern and central Tasmania.

Material: Little Florentine River, 13.v.1998, A.M.Young (*hb. Young 2023*; BRI); Johns Rd nr Geeveston, 19.v.1998, A.M.Young (*hb. Young 2042*; BRI); Johns Road nr Geeveston, 19.v.1998, A.M.Young (*hb. Young 2043*; MEL 2087776); Little Florentine River, 26.v.1999, A.M.Young (*hb. Young 2268*; MEL 2087766); Five Road, 24.iv.1997, A.K.Mills (*hb. Mills 1451*; HO 508572); Mt Field, 24.iv.1997, A.K.Mills (*hb. Mills 1454*; HO 508574); Johns Road nr Geeveston, 24.ix.1997, A.K.Mills (*hb. Mills 1471*; HO 508575); Johns Road nr Geeveston, 24.ix.1997, A.K.Mills (*hb. Mills 1472*; HO 508576); Johns Road nr Geeveston, 24.ix.1997, A.K.Mills (*hb. Mills 1473*; HO 508577); MEL 2087783); Johns Road nr Geeveston, 24.ix.1997, A.K.Mills (*hb. Mills 1477*; HO 508578); Arve Loop Rd nr Geeveston, 11.v.1998, A.K.Mills (*hb. Mills 1535*; HO 508580); Sandspit Forest Reserve nr Wielangta, 3.vi.1998, A.K.Mills (*hb. Mills 1553*; HO 508582); Sandspit Forest Reserve nr Wielangta, 3.vi.1998, A.K.Mills (*hb. Mills 1554*; HO 508583); Rutherford Rd nr Geeveston, 18.vi.1998, A.K.Mills (*hb. Mills 1570*; HO 508570); Location and date unknown, A.J.Monks (ZT 4575; BRI).

Remarks: The decurrent lamellae and the cream discolouration at the centre of the otherwise white pileus are characteristic of this taxon. Occasional large basidiomes (pilei approaching 40 mm diameter) may be encountered, but all other characters remain constant. Microscopically, the small, subglobose spores measuring $(4.5\text{--}5\text{--}7\text{--}7.5) \times 4.5\text{--}5.5\text{--}(6) \mu\text{m}$ are very distinctive. Macroscopically, *H. rodwayi* could be confused with *H. virginea* (Wulfen: Fr.) P.D.Orton & Watling, but the latter species is easily separated microscopically because it has larger, oblong to ellipsoid spores measuring $7.0\text{--}12.5 \times 3.5\text{--}7.5 \mu\text{m}$.

Subgenus 2 *Hygrocybe*

Basidiome frequently vividly coloured (red, orange, yellow); *pileus* often conical; *lamellae* free, adnexed or narrowly adnate; *hymenophoral trama* strictly regular, composed of very long (500–3000 μm), tubular, aseptate elements with tapered ends; *cystidia* sometimes present; *clamp connections* generally present throughout the basidiome.

One species in Tasmania.

5. *Hygrocybe astatogala* (R.Heim) Heinem., *Bull. Jard. Bot. État* 33: 436 (1963); *Bertrandia astatogala* (R.Heim) R.Heim, *Rev. Mycol.* 31: 155 (1966). Type: Madagascar. (holotype P, n.v.)

Illustrations: Fuhrer & Robinson (1992), p. 8; Young & Wood (1997), p. 933.

Pileus conical, often red or yellow but rapidly becoming black; all tissues rapidly blackening on bruising and exuding a pale, watery yellow fluid if cut, pileal and stipe surfaces covered in abundant, blackish fibrils.

Habitat and distribution: solitary, gregarious or sometimes in troops amongst leaf litter, moss or directly on soil in cool temperate rainforest; often in very sheltered locations. The species is widely distributed in central, northern and western Tasmania.

Material: Arve Loop Rd nr Geeveston, 27.iv.1998, A.M.Young (*hb Young 1953*; BRI); Mt Field, 30.iv.1998, A.M.Young (*hb Young 1981*; BRI); Tahune, 17.v.1999, A.M.Young (*hb Young 2214*; MEL 2087775); Tasman Pen., 25.v.1999, A.M.Young (*hb Young 2252*; MEL 2087768); Fire Rd nr Geeveston, 24.iv.1997, A.K.Mills (*hb Mills 1452*; HO 508573); Johns Rd nr Geeveston, A.K.Mills (*hb Mills 1478*; HO 508579); Sandspit Forest Reserve nr Wielangta, 3.vi.1998, A.K.Mills (*hb Mills 1552*; HO 508581); Franklin R., 13.iv.1991, E.Horak (ZT 4323; BRI); Collinsvale, 3.iv.1991, E.Horak (ZT 4806; BRI).

Remarks: *Hygrocybe astatogala* is widespread and often abundant in Tasmania; troops of 20–30 basidiomes are frequently encountered. Most collections are from amongst leaf litter rather than moss. Although juvenile basidiomes are brilliant red, mature basidiomes are often jet black except for the yellow lamellae. Monks (1989) described Tasmanian variants of *H. astatogala* which differed only in that they had ellipsoid spores [$8.5\text{--}10.5 \times 5.5\text{--}7 \mu\text{m}$, mean $9.5 \times 6.2 \mu\text{m}$, mean Q: 1.47] rather than the usual sub-globose spores [$7.5\text{--}10 \times 6\text{--}8.5 \mu\text{m}$, mean $8.7 \times 6.8 \mu\text{m}$, Q: 1.0–1.6, mean Q: 1.28]. Two Mills collections (*hb. Mills 1452* and *hb. Mills 1478*) confirm Monks' findings because both of these collections have ellipsoidal spores (many with darker contents) measuring $7\text{--}10 \times 5.5\text{--}6.5 \mu\text{m}$, mean $8.8 \times 6.3 \mu\text{m}$, Q: (1.1–)1.2–1.6, mean Q: 1.39; all other characters of these basidiomes with ellipsoidal spores conform to those of the basidiomes with subglobose spores. Monks also suggested that the difference in spore shape may be a function of the substrate and that moss/litter/peat substrates yield basidiomes with sub-globose spores while substrates derived at least in part from siliceous rocks yield basidiomes with ellipsoid spores. It is not known if the Tasmanian collections detailed above conform to Monks' hypothesis.

Subgenus 3 *Pseudohygrocybe* Bon, *Doc. Mycol.* 24: 42 (1976). *Typical species:* *Hygrocybe coccinea* (Schaeff.: Fr.) P.Kumm.

Basidiome variously coloured often brightly (red, orange, yellow, green, lilac); *pileus* conical, convex or umbilicate; *lamellae* narrowly adnate to decurrent; *cystidia* sometimes present as cheilocystidia, rarely as pseudo-pleurocystidia; *hymenophoral trama* regular, subregular to slightly irregular, composed of short, cylindrical to inflated elements 20–300 μm long (rarely up to 700 μm); clamp connections generally present throughout the basidiome.

6. *Hygrocybe anomala* A.M.Young, in Young & Wood *Austral. Syst. Bot.* 10: 919 (1997). *Type:* New South Wales, Blackheath, 23.vi.1983, A.E.Wood s.n. (holotype UNSW 83/991).

1. Pileus at first viscid; without lilac tints on pileus or lamellae6a. var. *anomala*
 1. Pileus always dry; lilac tints present on either or both pileus and lamellae
6b. var. *ianthinomarginata*

6a. *Hygrocybe anomala* A.M.Young var. *anomala*

Illustration: Young & Wood (1997), p. 920.

Habitat and distribution: gregarious amongst moss in cool, temperate rainforest; variety *anomala* is known from locations in southern, central and north-western Tasmania.

Material: Julius River nr Smithton, 6.vi.1998, A.M.Young (*hb. Young 1987*; BRI); Arve Loop Rd nr Geeveston, 11.v.1998, A.M.Young (*hb. Young 2020*; BRI); Little Florentine River, 26.v.1999, A.M.Young (*hb. Young 2263*; BRI); Arve Loop Rd nr Geeveston, 27.iv.1998, A.M.Young (*hb. Young 1963*; MEL 2087779); Arve Loop Rd nr Geeveston, 17.v.1999, A.K.Mills (*hb. Young 2222*; MEL

2087774); Arve Loop Rd nr Geeveston, 17.v.1999, A.K.Mills (*hb. Young* 2224; MEL 2087773); Little Florentine River, 26.v.1999, A.M.Young (*hb. Young* 2264; MEL 2087767).

Remarks: *Hygrocybe anomala* var. *anomala* has both a viscid pileus and stipe and there are no lavender/lilac tints on either pileus or lamellae. It appears to be widespread and fairly common in Tasmania.

6b. *Hygrocybe anomala* A.M.Young var. *ianthinomarginata*, A.M.Young, *Austrobaileya* 5: 551 (1999). *Type:* New South Wales, Lane Cove Bushland Park, 13.vi.1998, R. & E.Kearney & A.M.Young (*hb. Young* 2111) (holotype DAR 73918).

Illustration: Young (1999), p.552.

Habitat and distribution: gregarious amongst moss or humus in cool temperate rain-forest: variety *ianthinomarginata* is known from southern and north-western Tasmania.

Material: Julius River, 6.v.1998, A.M.Young (*hb. Young* 1986; BRI); Johns Road, 19.v.1998, A.M.Young (*hb. Young* 2048; BRI); Franklin River, 21.v.1999, A.M.Young (*hb. Young* 2247; BRI); Franklin R., 7.v.1998, A.M.Young (*hb. Young* 2002; MEL 2087778); Growlingswallet nr Mt Field, 19.v.1999, G.Gates (*hb. Young* 2231; MEL 2087771).

Remarks: Tasmanian material identified as this variety always has a dry pileus and stipe. Microscopic examination shows that both pileus and stipe have a simple cutis and never display the ixocutis present in var. *anomala*. The type description states that the pileus has a lilac margin and may be slightly umbonate, whereas Tasmanian material is often distinctly umbonate and the lilac marginal tints are weak or lacking. However, the lamellae are always distinctly lilac tinted and microscopic examination always shows the presence of spinose spores. Despite the slight differences, the Tasmanian material is confidently assigned to var. *ianthinomarginata*.

7. *Hygrocybe cantharellus* (Schwein.) Murrill, (as *Hydrocybe*), *Mycologia* 3: 196 (1911); *Agaricus cantharellus* Schwein., *Schriften Naturf. Ges. Leipzig* 1: 88 (1822); *Hygrophorus cantharellus* (Schwein.) Fr., *Epicr. Syst. Mycol.*: 329 (1838). *Type:* none designated.

Illustrations: Boertmann, D (1995): p. 111; Young & Wood (1997), p. 962.

Habitat and distribution: gregarious amongst moss and humus in cool temperate rain-forest or gregarious amongst moss in heath. The species appears to be widespread in southern and central Tasmania.

Material: Tahune, 17.v.1999, A.M.Young & A.K.Mills (*hb. Young* 2213; BRI); Arve Loop Rd nr Geeveston, 27.iv.1998, A.M.Young (*hb. Young* 1968; MEL 2088590); Limebay Reserve, 12.v.1999, A.K.Mills (*hb. Young* 2209; MEL 2088608); Arve Loop Rd nr Geeveston, 17.v.1999, A.K.Mills (*hb. Mills* 1514; HO 508596).

Remarks: Tasmanian material has the usual distinguishing characteristics of this taxon: a dry, red pileus with a finely velvety surface (at least at the centre), bright red, dry stipe, and pale yellow, decurrent lamellae. The basidiomes usually have stipes that are at least 2–3 times longer than the pileus diameter. The species does not appear to be particularly common. *Hygrocybe cantharellus* is one of the very few species of Tasmanian *Hygrophoraceae* that has been found outside the cool temperate rainforests; there is a single collection (*hb. Young* 2209) from heath.

8. *Hygrocybe chromolimonea* (G.Stev.) T.W.May & A.E.Wood, *Mycotaxon* 54: 147–150 (1995); *Hygrophorus chromolimoneus* G.Stev., *Kew Bull.* 16: 383 (1962). *Gliophorus*

chromolimoneus (G.Stev.) E.Horak, *Beih. Nova Hedwigia* 43: 167 (1973). *Type*: New Zealand. Lake Rotoiti, 16.v.1956, *E.B.Kidson* (*Stevenson 1088*) (holotype K).

Illustrations: Fuhrer and Robinson (1992): p. 41; Young & Wood (1997), p. 964.

Habitat and distribution: gregarious to caespitose amongst moss or humus in cool temperate rainforest; sometimes in association with old tree fern bases. The species is widespread and common.

Material: Arve Loop Rd nr Geeveston, 27.iv.1998, *A.M.Young* (*hb. Young 1967*; BRI); Milkshake Reserve, 6.v.1998, *A.M.Young* (*hb. Young 1997*; BRI); Julius R., 6.v.1998, *A.M.Young* (*hb. Young 1990*; MEL 2088592); Little Florentine R., 13.v.1998, *A.M.Young* (*hb. Young 2027*; MEL 2088603); Growlingswallow nr Mt Field, 19.v.1999, *G.Gates* (*hb. Young 2232*; MEL 2088611); Arve Loop Rd nr Geeveston, 17.v.1998, *A.K.Mills* (*hb. Mills 1512*; HO 508594); Arve Loop Rd nr Geeveston, 17.v.1998, *A.K.Mills* (*hb. Mills 1513*; HO 508595); Roger River Reserve, 6.v.1998, *A.K.Mills* (*hb. Mills 1520*; HO 508599); Sandspit Forest Reserve nr Wielangta, 3.vi.1998, *A.K.Mills* (*hb. Mills 1550*; HO 508605); Sandspit Forest Reserve, 23.iv.1991, *E.Horak* (ZT 4957; BRI); Franklin R., 13.iv.1991, *E.Horak* (ZT 4336; BRI).

Remarks: The viscid and wholly bright yellow basidiomes with convex, umbilicate pilei are very distinctive. The greyish, glutinous margin on each lamella can be seen with the unaided eye but is very easily seen with a $\times 10$ lens. A difficulty when examining herbarium material is that the cheilocystidia often collapse and adhere strongly to each other within the gluten layer but the latter does remain very clearly visible as a translucent region on the lamella margin. Gentle heating in the microscope mountant is often required before the cheilocystidia will separate so that they can be clearly observed.

Tasmanian material of *Hygrocybe chromolimonea* sometimes has slightly larger spores [(8–)8.5–10.5(–12) \times 4.5–6.5 μm] than either the holotype (7.5–9.5 \times 4.5–6 μm) or typical Australian mainland material [(6.5–)7–9(–11) \times 4–6(– 6.5) μm] however because there is so much overlap of spore ranges and all other aspects of the basidiomes remain constant, this difference in spore size is not considered important.

9. *Hygrocybe erythrocrenata* Monks & A.K.Mills, *Mycotaxon* 46: 87 (1993). *Type*: Tasmania. Moonlight Ridge nr Lune River, viii.1989, *A.J.Monks* s.n. (holotype HO 131196).

Illustration: Mills & Monks (1993), p. 89.

Spores (6–)7–9.5 \times 3.7–5.5 μm , mean 7.5 \times 4.3 μm , Q: 1.4–2.1, mean Q: 1.73, ellipsoid to subcylindrical, smooth, hyaline, occasionally constricted. *Basidia* 41–59 \times 6–8.5 μm , mean 48.4 \times 7.2 μm , Q: 5.3–8.8, mean Q: 6.71, 2- or 4-spored, clamped. *Hymenophoral trama* regular to subregular and consisting of hyaline, thin-walled, cylindrical to ellipsoid, inflated elements 29–72 \times 5.5–17 μm , clamp connections abundant. *Pileipellis* a cutis of cylindrical, hyaline, septate, thin-walled hyphae 2.5–8.5 μm diam., clamp connections abundant. *Stipitipellis* a cutis of cylindrical, hyaline, septate, thin-walled hyphae 1.5–5 μm diam., clamp connections abundant.

Habitat and distribution: solitary or gregarious on soil, in humus or amongst moss in cool temperate rainforest. The species appears to be widespread and reasonably common.

Material: Arve Loop Rd nr Geeveston, 27.iv.1998, *A.M.Young* (*hb. Young 1959*; BRI); Little Florentine R., 13.v.1998, *A.M.Young* (*hb. Young 2025*; BRI); Little Florentine R., 13.v.1998, *A.M.Young* (*hb. Young 2032*; MEL 2090262); Little Florentine R., 13.v.1998, *A.K.Mills* & *G.Gates* (*hb. Young 2270*; MEL 2090267); Moonlight Ridge nr Lune River, viii.1989, *A.J.Monks* s.n. (holotype HO 131196).

Remarks: Re-examination of the holotype has provided the additional microcharacter data listed above. Spore measurements taken from different basidiomes in the holotype demonstrate that otherwise identical basidiomes can produce different sized spores. The

spore sizes obtained from the holotype are a little larger than those of the original description [(5.5–)6–8 × 3.5–5 µm], but these larger spore dimensions correlate almost perfectly with the three collections made of this taxon during 1998.

The protologue of *Hygrocybe erythrocrenata* states that colour variations of the subdecurrent to decurrent lamellae occur, and indicates that such variations may be found within a population of basidiomes occurring in a restricted area (and by implication from the same mycelium). Mills and Monks (1993) stated that lamellae colour variations range from “white or yellowish white to pinkish white (7–10A2) or pallid reddish grey (12B2)”. Collections made during 1998 and positively assigned to this taxon have adnate lamellae with at most a decurrent tooth; the lamellae are coloured either dark red (10C7) or violaceous red (12A3–12A4). These collections also produce the violet-magenta spore print described in the protologue, have the same red pileus and stipe and their microcharacters show only the minor variations that can be normally expected within a species. *Hygrocybe erythrocrenata* thus appears to be a taxon which exhibits considerable colour variation of the lamellae. The variants with whitish lamellae appear to produce white spore prints while the dark red to violaceous red lamellae variants produce white spore prints that show the violet-magenta tints when the spores are scraped together into a small mass. All basidiomes have the same colours and surfaces for the pileus and stipe and their microcharacters.

The vivid red stipe reported in this taxon after drying (Mills & Monks 1993) fades with time. Material inspected immediately after the drying process is complete has brownish pilei with intensely carmine-red stipes, however the carmine-red colouration typically slowly disappears and stipes of dried material that is two or three years old are usually only faintly red tinted or brownish. The holotype shows this tendency to fade: eleven years after collection, only a single stipe has any trace of the carmine-red color and the remainder are yellowish brown or have a slight orange tint.

10. *Hygrocybe firma* (Berk. & Broome) Singer, *Sydowia* 11: 355 (1957). *Hygrophorus firma* Berk. & Broome, *J. Linn. Soc., Bot.* 11: 563 (1871). *Type*: Sri Lanka. Peradeniya, i.1869, *H.K.Thwaites* (*Thwaites* 880) (holotype K, *n.v.*)

Illustrations: Young, Bougher & Robinson (2000), p. 43; Young (2000b), cover photo; Fuhrer & Robinson (1992), p. 44 (as *Hygrocybe procera*).

Habitat and distribution: gregarious to caespitose in moss beds in cool temperate rainforest. The species appears to be common and widespread in central and north-western Tasmania.

Material: Franklin R., 7.v.1998, *A.M.Young* (*hb. Young* 2004; BRI); Arve Loop Rd nr Geeveston, 17.v.1999, *A.M.Young* (*hb. Young* 2221; BRI); Growlingswallow nr Mt Field, 19.v.1999, *A.M.Young* (*hb. Young* 2238; BRI); Franklin R., 7.v.1998, *A.M.Young* (*hb. Young* 2010; MEL 2090261); Franklin R., 21.v.1999, *A.M.Young* (*hb. Young* 2245; MEL 2090264); Tasman Peninsula, 25.v.1999, *A.M.Young* (*hb. Young* 2256; MEL 2090265); Rutherford Rd nr Geeveston, 18.vi.1998, *A.K.Mills* (*hb. Mills* 1580; HO 509005); Mt Field, 20.iv.1991, *E.Horak* (ZT 4942; BRI).

Remarks: *Hygrocybe firma* seems to be common in Tasmanian moss forests and is sometimes mistaken for *Hygrocybe miniata*, which appears to be relatively rare. The two are readily separated microscopically as *H. firma* has dimorphic spores, with the macrospores measuring 11–18 µm in length while *H. miniata* has monomorphic spores measuring 7–9.5(–10) µm in length. Macroscopically, Tasmanian specimens of *H. firma* seem to produce extremely long stipes and the pilei tend to remain hemispheric and umbilicate rather than expanding to the more or less plane pilei with central depressions that are encountered in some of the tropical variants.

Initial observations on lamellae samples suggested both spore and basidia dimorphism. Since a spore print (or similar deposit) may be considered to contain a very high

proportion of mature spores, two samples of stipe surface immediately underneath the lamellae were examined for deposited spores and all spores on each sample were measured. This procedure aimed to maximise a random selection of fully matured spores. A combined total of 85 macrospores and microspores were measured and the results forwarded to Dr David Ratkowsky of the University of Tasmania for statistical analysis (Univariate Procedure - SAS System, SAS Institute 1990). Dr Ratkowsky's analysis confirmed the bimodal distribution and provided further evidence that the Tasmanian populations belong to *H. firma*.

Hygrocybe firma is an exceptionally variable taxon with both yellow and red pilei which may be hemispheric, convex or umbilicate (Corner 1936; Dennis 1970; Pegler 1983, 1986). Corner's seventeen varieties (Corner 1936) have not been widely used and scepticism with respect to the constancy of the varietal characters (Heim 1967) led to his concept of *H. firma* as a variable species. Pegler (1983) used *H. firma* var. *firma* but later (Pegler 1986) preferred to consider the taxon as variable and used only the epithet of *H. firma*. His concept is followed here. Western Australian material considered to be *H. firma* (Young *et al.* 2000) has red, convex to deeply umbilicate pilei which fade to orange or yellow-orange and this agrees wholly with material from the type locality of Sri Lanka (Pegler 1986). The Tasmanian material has brilliant red pilei and stipes and reddish tinted lamellae. This also conforms with known variations of the taxon.

There remains the cluster of taxa reported from New Zealand (Horak 1990) which includes *Hygrocybe firma*, *H. miniceps* (G.Stev.) E.Horak and *H. procera* (G.Stev.) E.Horak, all of which have yellow to red basidiomes, trichoderms on the pilei and large spores. Currently, the last two taxa can be separated from *H. firma* because they are not considered to have dimorphic spores or basidia and *H. procera* is then separated on the basis of its amygdaliform spores compared to the ellipsoidal spores of *H. miniceps*. The two latter taxa are obviously closely related and may be variants of a single taxon. Neither has yet been confirmed for Australia.

11. *Hygrocybe franklinensis* A.M.Young & A.K.Mills, *sp. nov.*

Pileus 9–18(–25) mm, scarlatinus, conicus vel papillato-umbonatus deinde lato-conicus, glaber, viscidus, striatus, ad marginem concolorum vel flavidum. Lamellae adnatae vel subadnatae, aurantiaco-rosae, ad marginem subflavae. Stipes 25–45 × 2–5 mm, scarlatinus, siccus, laevis, cylindricus, ad basim flavidum. Sporae (7–)8–9.5(–10.5) × 5–6 (–6.5) µm, ovoideae vel ellipsoideae, hyalinae, aliquot subconstrictae. Basidia 38–52 (–60) × 7–9.5(–10.5) µm, 4-sporea, fibulata. Cystidia nulla. Trama hymenophoralis regularis vel subregularis, fibulata. Epicutis pilei ixocutem formans. Gregaria in musco sylvestri.

Type: Tasmania. Franklin R., 21.v.1999, A.M.Young (*hb. Young 2243*) (holotype HO 508993)

Pileus 9–18(–25) mm, brilliant red (10A8), acutely conical and usually with a sub-papillate umbo expanding to broad conical, smooth, viscid, striate when moist, margin sometimes concolorous but usually yellow tinted, even or a little ragged occasionally slightly crenulate. *Lamellae* narrowly adnate and then usually with a slight decurrent tooth or ascending-adnate, orange-pink (6A5–8A5), margins are pale yellow (4A6) and even. *Stipe* 25–45 × 2–5 mm, red (10A8) near the pileus but yellow towards the base (3A4), smooth, dry, hollow, cylindrical.

Spores (7–)8–9.5(–10.5) × 5–6 (–6.5) µm, mean 9.0 × 5.6 µm, Q: 1.5–1.8 (–2.0), mean Q: 1.65, ovoid to ellipsoid, hyaline, smooth, occasionally a little constricted. *Basidia* 38–52 (–60) × 7–9.5(–10.5) µm, mean 48.1 × 8.1 µm, Q: 4.3–6.8(–7.2), mean Q: 5.93, 4-spored (occasionally 2-spored), clamped. *Cystidia* absent. *Hymenophoral trama* regular to sub-regular, composed of thin-walled, hyaline, inflated, cylindrical to fusiform or

moniliform elements $25\text{--}95 \times 7\text{--}25 \mu\text{m}$, clamp connections abundant. *Pileipellis* an ixocutis composed of repent, cylindrical, septate, thin-walled hyphae, $2\text{--}4.5 \mu\text{m}$ diam., clamp connections abundant. *Stipitipellis* a cutis of repent, cylindrical, thin-walled, septate hyphae $2\text{--}5\text{--}(7) \mu\text{m}$ diam., clamp connections abundant. (Fig. 1)

Habitat and distribution: solitary or gregarious amongst moss in cool temperate rain-forest. The species appears to be widespread in southern and north-western Tasmania.

Material: Franklin R., 7.v.1998, A.M.Young (*hb. Young 2007*; BRI); Arve Loop Rd Harz Mtn, 17.v.1999, A.M.Young (*hb. Young 2228*; BRI); Arve Loop Rd nr Geeveston, 17.v.1999, A.M.Young (*hb. Young 2223*; MEL 2090263); Franklin R., 21.v.1999, A.M.Young (*hb. Young 2243*; HO 508993, holotype).

Remarks: *Hygrocybe franklinensis* is similar to *H. xanthopoda* A.M.Young which also has a scarlet, conical, viscid pileus but differs by having pure yellow, adnexed (occasionally ascending-adnate to very narrowly adnate) lamellae and a yellow to orange-yellow, inflated stipe. Both *H. franklinensis* and *H. xanthopoda* have an ixocutis on the pileus and a dry stipe which separates them from the New Zealand species *H. cavipes* E.Horak which has an ixotrichoderm on the pileus and a viscid stipe.

Etymology: After the type locality of Franklin River, Tasmania.

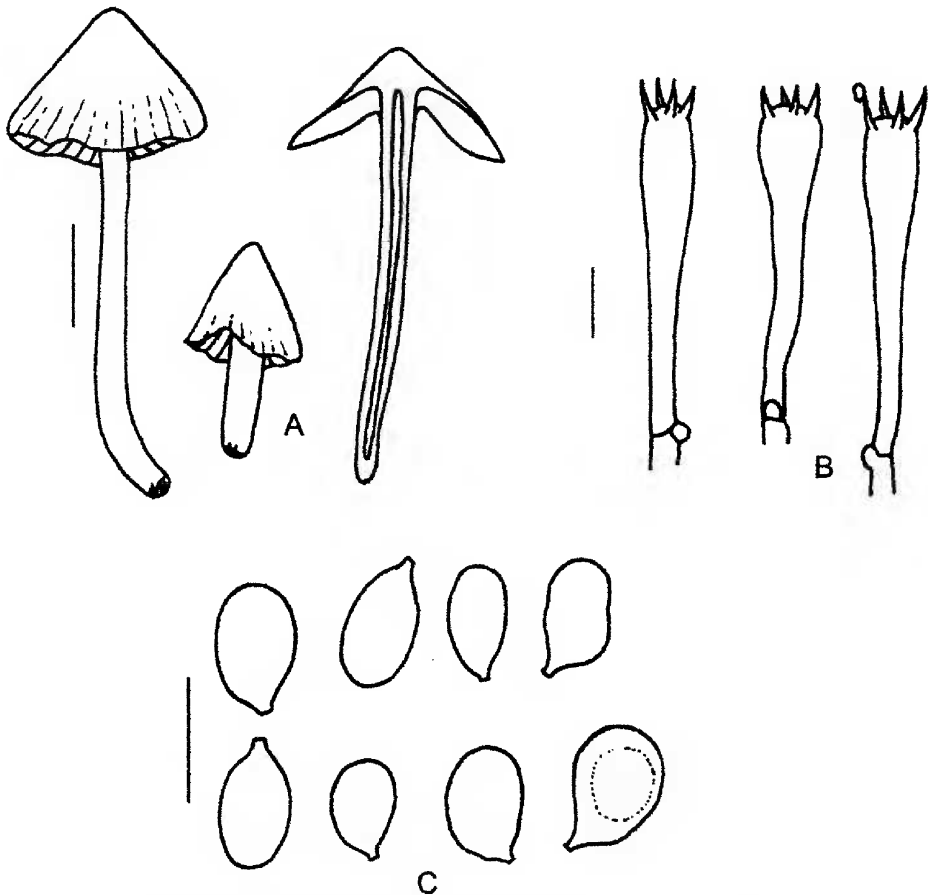


Figure 1. *Hygrocybe franklinensis* (holotype). **A** habit; **B** basidia; **C** spores. Habit and T/S sketch, bar = 10 mm; microcharacters, bar = 10 μm .

12. *Hygrocybe graminicolor* (E.Horak) T.W.May & A.E.Wood, *Mycotaxon* 54: 147–150 (1995). *Gliophorus graminicolor* E.Horak, *Beih. Nova Hedwigia* 43: 176 (1973). *Type*: New Zealand. Ngahere, 21.iii.1968, E. Horak s.n. (holotype PDD 27096).

Hygrocybe batesii A.M.Young, *Austral. Syst. Bot.* 10: 956 (1997). *Type*: Australia. New South Wales, Monga State Forest, 16.v.1984, A.E.Wood & N.B.Gartrell s.n. (holotype UNSW 84/522).

Gliophorus pallidus E.Horak, *Beih. Nova Hedwigia* 43: 164 (1973). *Type*: New Zealand. Auckland, 27.vi.1968, E. Horak s.n. (holotype PDD 27090).

Illustrations: Fuhrer & Robinson (1992), p. 40; Young & Wood (1997), p. 975 and p. 958 as *H. batesii*.

Habitat and distribution: gregarious to caespitose in humus, litter and moss in cool temperate rainforests. The species appears to be very common and widespread in central and north-western Tasmania and often occurs in large troops.

Material: Arve Loop Rd nr Smithton, 27.iv.1998, A.M.Young (*hb. Young 1955*; BRI); Tahune, 27.iv.1998, A.M.Young (*hb. Young 1957*; BRI); Tahune, 27.iv.1998, A.K.Mills (*hb. Young 1960*; BRI); Tahune, 27.iv.1998, A.M.Young (*hb. Young 1962*; BRI); Mt Field, 30.iv.1998, A.M.Young (*hb. Young 1973*; BRI); Franklin R., 7.v.1998, A.M.Young (*hb. Young 2005*; BRI); Milkshake Reserve nr Smithton, 6.v.1998, A.M.Young (*hb. Young 1995*; MEL 2088594); Lake Chisholm, 6.v.1998, A.M.Young (*hb. Young 2000*; MEL 2088595); Franklin R., 7.v.1998, A.M.Young (*hb. Young 2008*; MEL 2088596); Franklin R., 7.v.1998, A.M.Young (*hb. Young 2009*; MEL 2088597); Arve Loop Rd nr Geeveston, 11.v.1998, A.M.Young (*hb. Young 2015*; MEL 2088598); Tahune, 17.v.1999, A.M.Young & A.K.Mills (*hb. Young 2218*; MEL 2088610); Five Road, 24.iv.1997, A.K.Mills (*hb. Mills 1458*; HO 508587); Five Road, 24.iv.1997, A.K.Mills (*hb. Mills 1459*; HO 508588); Five Road, 24.iv.1997, A.K.Mills (*hb. Mills 1461*; HO 508590); Johns Rd nr Geeveston, 24.ix.1997, A.K.Mills (*hb. Mills 1475*; HO 508994); Arve Loop Rd nr Geeveston, 17.v.1998, A.K.Mills (*hb. Mills 1511*; HO 508593); Arve Loop Rd nr Geeveston, 17.v.1998, A.K.Mills (*hb. Mills 1515*; HO 508597); Arve Loop Rd nr Geeveston, 17.v.1998, A.K.Mills (*hb. Mills 1516*; HO 508598); Franklin R., 7.v.1998, A.K.Mills (*hb. Mills 1530*; HO 508600); Arve Loop Rd nr Geeveston, 11.v.1998, A.K.Mills (*hb. Mills 1536*; HO 508601); Sandspit Forest Reserve nr Wielangta, 3.vi.1997, A.K.Mills (*hb. Mills 1551*; HO 508606); Sandspit Forest Reserve nr Wielangta, 9.vi.1997, A.K.Mills (*hb. Mills 1562*; HO 509002); Jacksons Bend, 14.x.1998, G.Gates (*hb. Mills 1605*; HO 508611); Jacksons Bend, 14.x.1998, G.Gates (*hb. Mills 1606*; HO 508612); Sandspit Forest Reserve, 23.iv.1991, E.Horak (ZT 4956; BRI); Collinsvale, 3.iv.1991, E.Horak (ZT 4809; BRI); Milkshake Reserve, 9.iv.1991, E.Horak (ZT 4886; BRI).

Remarks: The green to brown colour variations of this taxon have already been fully described in Young (1999). *Hygrocybe graminicolor* is often extremely spectacular in the size of its troops amongst moss and 50 or more basidiomes may appear. Occasional variants appear (*hb. Mills 1562*) in which the cheilocystidia are greatly reduced in number. These variants correspond to the normal characteristics in every other way (including spore size 6.5–7.7 × 4–4.5 µm) but cheilocystidia are only occasionally seen and the lamellae margins become fertile. Without the cheilocystidia present, the gluten thread tends to disappear as the basidiomes age.

13. *Hygrocybe irrigata* (Pers.: Fr.) Bon, *Doc. mycol.* 6: 41 (1976). *Agaricus irrigatus* Pers., *Syn. meth. Fung.*: 361 (1801). *Agaricus irrigatus* Pers.: Fr., *Syst. Mycol.* 1: 101 (1821). *Hygrophorus irrigatus* (Pers.: Fr.) Fr., *Epicr. Syst. Mycol.*: 329 (1838). *Type*: none designated.

Illustrations: Boertmann (1995), p. 89; Young, Kearney & Kearney (2001, in edit.)

Habitat and distribution: gregarious amongst moss in cool temperate rainforest. The species is known from central and south-eastern Tasmania.

Material: Little Florentine River, 13.v.1998, A.M.Young (*hb. Young 2030*; MEL 2088605); Sandspit Forest Reserve nr Wielangta, 1.xii.1998, G.Gates & D.Ratkowsky (*hb. Mills 1612*; HO 509012).

Remarks: In the field, this material resembles an 'all-grey to grey-brown' and extremely glutinous version of *Hygrocybe graminicolor*, however there is never a tint of either yellow or green at any stage on any part of the basidiome and the pilei are more or less conical rather than the convex and usually umbilicate pileus found in *H. graminicolor*. Dried material is greyish to brown and not the brick-pink associated with dried material of *H. graminicolor*. The gluten often has the appearance of a thickly applied layer. The field notes with *hb. Young 2030* recorded that the fresh lamellae margins had a glutinous thread, however, microscopic examination showed no traces of the gluten, no cheilocystidia and fertile lamellae margins. It is assumed that the observed thread was accidental and this assumption is supported by the field notes with collection *hb. Mills 1612* which state that no glutinous thread was present in fresh material.

The material corresponds almost perfectly with *H. irrigata* (Pers.: Fr.) Bon *sensu* Boertmann (1995). The two Tasmanian collections show minor variations of colour and pileus shape (varying from conic to convex) but all are within the range of characters exhibited by European collections. Boertmann (*pers. comm.*) examined material from *hb. Young 2030* and agreed that apart from slightly larger spores ($7.5\text{--}9.5 \times 5\text{--}7 \mu\text{m}$, mean $8.7 \times 6.0 \mu\text{m}$, Q: 1.2–1.6, mean Q: 1.5; European material $(5\text{--})6.5\text{--}8\text{--}(9.5) \times (3.5\text{--})4.5\text{--}5.5\text{--}(6) \mu\text{m}$, Q: 1.2–2.0, mean Q: 1.4–1.6), the Tasmanian material was well within the range of macrocharacters exhibited by European collections.

14. *Hygrocybe julietae* (G.Stev.) E.Horak, *New Zealand J. Bot.* 9: 431 (1971). *Hygrophorus julietae* G.Stev., *Kew Bull.* 16: 377 (1962). *Type:* New Zealand. Wellington, 1.vii.1949, G.Stevenson (*Stevenson 697*) (holotype K).

Illustrations: Horak (1990), p. 269; Stevenson (1963), plate 6 fig. 9.

Pileus 15–18 mm, at first dark greyish yellow (near 4B5) becoming light greyish yellow to clear yellow (near 3A6), convex, dry, margins striate and crenulate or occasionally a little lobed. *Lamellae* decurrent, yellowish grey (4C5/B5) to light yellow (near 3A6), distant, margins even and concolorous. *Stipe* 50–60 \times 1.5–2.5 mm, dry, yellow (near 3A6) tapering downwards, solid then becoming narrowly cavernous. *Spore print* white.

Spores 6–8.5 \times 3.5–5 μm , mean 6.9 \times 3.9 μm , Q: 1.4–2.2, mean Q: 1.80, smooth, hyaline, cylindrical to ovoid or narrowly ellipsoid, mostly constricted. *Basidia* 33–40 \times 6.0–8.5 μm , mean 37 \times 7.2 μm , Q: 4.3–6.0, mean Q: 5.13, 4-spored, clamped. *Cystidia* absent. *Hymenophoral trama* regular or occasionally subregular, composed of more or less parallel chains of hyaline, inflated, thin-walled, clamped elements 22–58 \times 5–20 μm . *Pileipellis* a dry cutis with some hyphal gelatinisation or a weakly formed ixocutis, hyphae hyaline, thin-walled, cylindrical, septate, 2.5–4.2 μm , clamp connections present (clamp connections sometimes only occasional on upper cutis elements but common on lower cutis elements); lactifers present in subcuticular layers as highly refractive, often contorted or convoluted hyphae, 1–3 μm diameter. *Stipitipellis* a dry cutis with some hyphal gelatinisation or a weakly formed ixocutis with elements that are hyphal, cylindrical, hyaline, thin-walled, clamped, 1–3 μm diameter. (Fig. 2)

Habitat and distribution: gregarious in leaf mould in cool temperate rainforest. The species is known only from the single location in southern Tasmania.

Material: Arve Loop Road nr Geeveston, 11.v.1998, A.M. Young (*hb. Young 2014*; BRI).

Remarks: This taxon with its yellow convex pileus and constricted spores is neither *Hygrocybe blanda* E.Horak with its distinctively conic or campanulate pilei and ellipsoid, non-constricted spores, nor *H. cerinolutea* E.Horak, which does have a convex pileus but has larger spores (8–10 \times 5.5–7 μm) without constrictions. The material when collected in the field was quite dry, however microscopic examination clearly demonstrated extensive hyphal gelatinisation on both pileus and stipe together with very firm adherence of

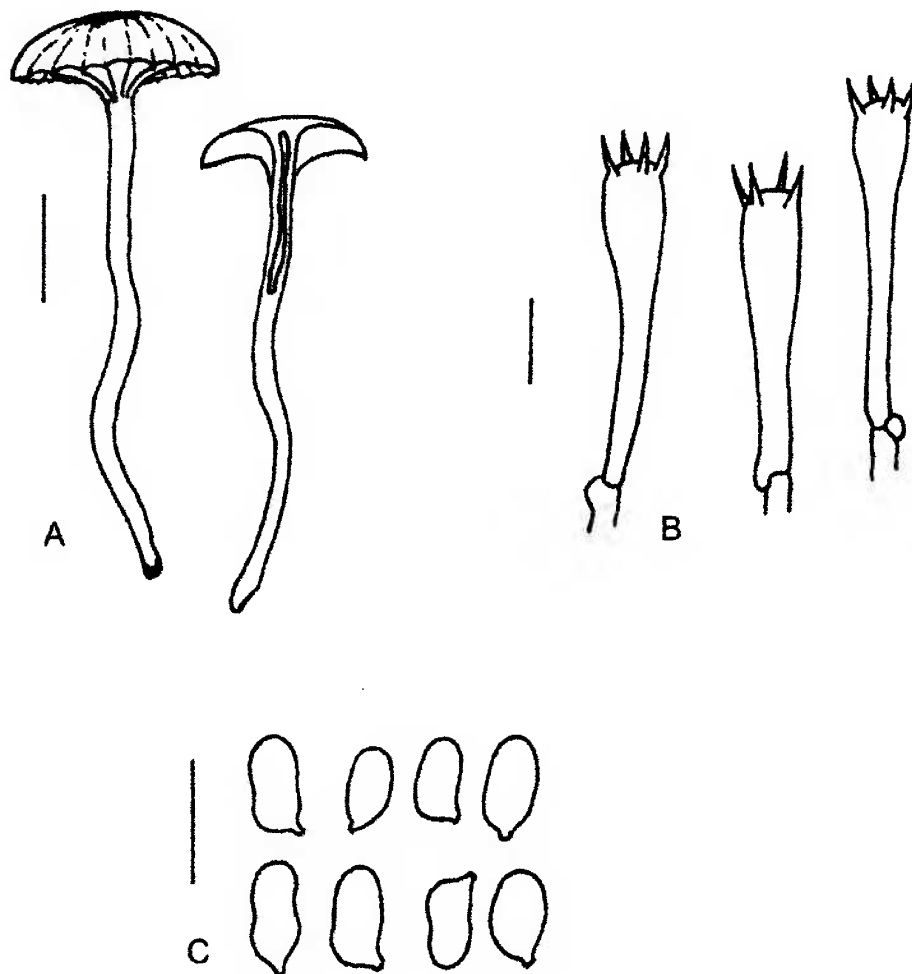


Figure 2. *Hygrocybe julietae* (hb. Young 2014; BRI). **A** habit; **B** basidia; **C** spores. Habit and T/S sketch, bar = 10 mm; microcharacters, bar = 10 μ m.

spores to the gelatinised hyphae. Both the protologue and the description of Horak (1990) indicate that *H. julietae* may be either viscid or dry in the field (almost certainly dependent upon local weather conditions); this Tasmanian collection conforms to this characteristic quite well.

15. *Hygrocybe leucogloea* A.M.Young, *Austral. Syst. Bot.* 10: 983 (1997). *Type:* New South Wales. Mt Wilson, 29.iv.1989, A.E.Wood s.n. (holotype UNSW 89/87).

Illustration: Young & Wood (1997), p. 984.

Pileus 35 mm, white, more or less convex, viscid. *Lamellae* very narrowly adnate, white, margins even and concolorous. *Stipe* 50 \times 8 mm, white, dry, smooth, pith filled.

Spores 6.0–7.7 \times 3.7–5.0 μ m, mean 6.8 \times 4.3 μ m, Q: 1.4–1.8 (–1.9), mean Q: 1.57, ellipsoid to narrow ellipsoid, hyaline, smooth. *Basidia* 42–50 \times 6–8 μ m, mean 45.3 \times 6.8 μ m, Q: 5.9–7.5, mean Q: 6.69, 4-spored, clamped. *Cystidia* absent. Hymenophoral trama

regular and composed of cylindrical to inflated ellipsoid elements which are hyaline, thin-walled, septate and $20\text{--}78 \times 3\text{--}11 \mu\text{m}$, clamp connections abundant. *Pileipellis* a very well developed ixotrichoderm up to $170 \mu\text{m}$ deep, composed of very loosely interwoven and aerial hyphae embedded in gluten; the ixotrichodermal hyphae are thin-walled, cylindrical, hyaline, $2\text{--}3.5 \mu\text{m}$ diam., clamp connections abundant and usually of medallion form. *Stipitipellis* a cutis (or possibly a very weak ixocutis as some gelatinisation seems to be present) composed of repent, cylindrical, hyaline, thin-walled hyphae $1.5\text{--}6 \mu\text{m}$ diam., clamp connections abundant.

Habitat and distribution: solitary in moss in cool temperate rainforest. The species is known only from the single locality.

Material: Tasman Peninsula, 25.v.1999, A.K.Mills (hb. Young 2251; MEL 2088614).

Remarks: The single basidiome in this collection was rather old but there is no doubt as to its identity. *Hygrocybe leucogloea* is the only known Australian taxon within the Hygrocybeae which has pure white basidiomes and an ixotrichoderm on the pileus; these characters are shared by the Tasmanian material. The American species, *Hygrophorus purus* Peck, is similar macroscopically but differs in that it belongs to sub-genus *Humidicutis* and does not have clamp connections anywhere in the basidiome except at the bases of the basidia.

The holotype of *Hygrocybe leucogloea* has spores that measure $(6.3\text{--})6.5\text{--}7.9\text{--}(8.5) \times 4.0\text{--}5.6 \mu\text{m}$, mean $7.2 \times 4.8 \mu\text{m}$, Q: 1.2–1.7, mean Q: 1.5 while those of the Tasmanian material measure $6\text{--}7.7 \times 3.7\text{--}5.0 \mu\text{m}$, mean $6.8 \times 4.3 \mu\text{m}$, Q: 1.4–1.8 (–1.9), mean Q: 1.57. The differences in dimensions are not considered important at this stage. A Victorian collection (MEL 261035) contained spores measuring $5.3\text{--}7.7 \times 4.0\text{--}5.3 \mu\text{m}$, mean $6.8 \times 4.5 \mu\text{m}$, Q: 1.3–1.8, mean Q: 1.5. This confirms the slight variations in spore dimensions that are to be found in this taxon (Young 2000a). The Tasmanian material displayed very narrowly adnate lamellae instead of the adnexed lamellae present in the holotype, however this is presently believed to be simply a variation likely to be encountered in future collections of this taxon. If all future Tasmanian collections of this taxon show similar lamellae attachments, a separate Tasmanian variety could be considered.

16. *Hygrocybe lilaceolamellata* (G.Stev.) E.Horak, *New Zealand J. Bot.* 9: 434 (1971). *Hygrophorus lilaceolamellatus* G.Stev., *Kew Bull.* 16: 378 (1963). *Type*: New Zealand. Wellington, 2.vi.1949, G.Stevenson (Stevenson 619) (holotype K).

Illustrations: Horak (1990), p. 269; Young & Wood (1997), p. 985; Fuhrer & Robinson (1992), p. 42.

Habitat and distribution: gregarious on soil or amongst leaf mould or moss in cool temperate rainforest. The species is widespread and common in southern, central and north-western Tasmania.

Material: Little Florentine R., 13.v.1998, A.M.Young (hb. Young 2029; BRI); Growlingswallow nr Mt Field, 19.v.1999, A.M.Young (hb. Young 2226; BRI); Julius R., 6.v.1998, A.M.Young (hb. Young 1989; MEL 2088591); Arve Loop Rd nr Geeveston, 11.v.1998, A.M.Young (hb. Young 2019; MEL 2088601); Little Florentine R., 26.v.1999, A.K.Mills & A.M.Young (hb. Young 2262; MEL 2088615); Roger River Reserve nr Smithton, 6.v.1998, A.K.Mills (hb. Mills 1523; HO 508996); Rutherfords Rd nr Geeveston, 18.vi.1998, A.K.Mills (hb. Mills 1578; HO 509003).

Remarks: This species is very distinctive with its warm brown pilei and contrasting lilac lamellae. The taxon is very variable with respect to spore size and shape. Mean Q has been found to vary from 1.65–1.97 indicating a variation from predominantly long-ellipsoid spores in the basidiomes of some collections to predominantly cylindrical spores in others. Spore constrictions may be frequent or only occasionally displayed in various collections. Sectioned lamellae from some collections have displayed a weakly

divergent trama and further study may result in the transfer of this species to the genus *Hygrophorus*.

17. *Hygrocybe miniata* (Fr.: Fr.) P.Kumm., *Führ. Pilzk.*: 112 (1871); *Agaricus miniatus* Fr.: Fr., *Syst. Mycol.* 1: 105 (1821); *Hygrophorus miniatus* (Fr.: Fr.) Fr., *Epicr. Syst. Mycol.*: 330 (1838). *Type*: Sweden. Smoland, 21.ix.1980, *M. Moser 80/372* (neotype IB, *n.v.*, designated by Arnolds 1986, p. 148).

Illustrations: Horak (1990), Plate 4, fig. 2; Young & Wood (1997), p. 989.

Habitat and distribution: gregarious on humus amongst moss in cool temperate rain-forest. The species is known from only a single collection in south-eastern Tasmania.

Material: Arve Loop Rd nr Geeveston, 27.iv.1998, *A.M.Young* (*hb Young 1964*; BRI).

Remarks: The single known collection suggests that *Hygrocybe miniata* is possibly rare in Tasmania but this should be regarded as very tentative. There may be several reasons for the single collection during the 1998–1999 Tasmanian trips including: the species may fruit abundantly at a different time of year; the most important areas where the fungus occurs have not yet been located; and the years 1998 and 1999 were not suitable years for optimum occurrence of the species. Much more collecting is required over a number of years to assess the species' true abundance and distribution. The basidiomes of this collection strongly resemble those of *H. firma*, but very careful analysis of the spores (including a spore print) has confirmed that they are not dimorphic and that they measure $7.5\text{--}9.5 \times 4.5\text{--}6.5 \mu\text{m}$, mean $8.4 \times 5.4 \mu\text{m}$, Q: 1.3–1.9, mean Q: 1.56. There is no doubt that this collection represents a variant of *H. miniata*.

18. *Hygrocybe pseudograminicolor* A.M.Young, *Austral. Syst. Bot.* 10: 992 (1997). *Type*: Australia. New South Wales. Mt Wilson, 26.iii.1994, *F.Taeker s.n.* (holotype UNSW 94/22).

Illustration: Young & Wood (1997), p. 994.

Habitat and distribution: gregarious to caespitose amongst leaf litter or in moss of cool temperate rainforests. The species is widespread and common in southern central and north-western Tasmania.

Material: Julius R., 6.v.1998, *A.M.Young* (*hb. Young 1988*; BRI); Arve Loop Rd nr Geeveston, 11.v.1998, (*hb. Young 2018*; MEL 2088600); Little Florentine R., 13.v.1998, *A.M.Young* (*hb. Young 2035*; MEL 2088606); Roger River Reserve nr Smithton, 6.v.1998, *A.K.Mills* (*hb. Mills 1518*; HO 508995); Arve Loop Rd nr Geeveston, 11.v.1998, *A.K.Mills* (*hb. Mills 1543*; HO 508998); Sandspit Forest Reserve nr Wielangta, 3.vi.1998, *A.K.Mills* (*hb. Mills 1549*; HO 508999); Sandspit Forest Reserve nr Wielangta, 3.vi.1997, *A.K.Mills* (*hb. Mills 1561*; HO 509001); Sandspit Forest Reserve nr Wielangta, 14.vii.1998, *A.K.Mills* (*hb. Mills 1587*; HO 509010); Franklin R., 13.iv.1991, *E.Horak* (ZT 4316; BRI).

Remarks: Although *Hygrocybe pseudograminicolor* does resemble *H. graminicolor* and both have cheilocystidia, the bright lime green lamellae of the former species serve to distinguish it in the field from the latter taxon which has white or at most green tinted lamellae. The spores of *H. pseudograminicolor* ($8.5\text{--}10.5 \times 5.0\text{--}7.7 \mu\text{m}$) are larger than those of *H. graminicolor* ($5.3\text{--}7.3 \times 3.3\text{--}5 \mu\text{m}$). The green pigments of *H. pseudograminicolor* also differ from *H. graminicolor* in that the former species becomes dull green when dried for herbarium storage, but the latter becomes brick-pink. The species is comparatively rare at the type locality but is quite common in Tasmania.

A peculiarity of this taxon is that the lamellar trama alters with maturation of the basidiome. During the early stages of development, the trama is regular but in late maturity it becomes more or less irregular.

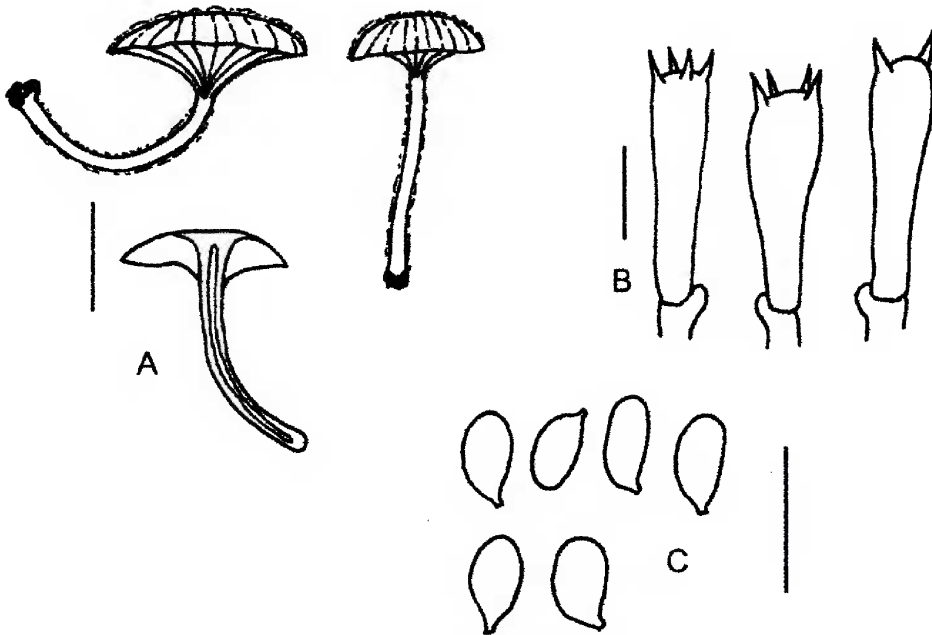


Figure 3. *Hygrocybe roseoflavida* (holotype). **A** habit; **B** basidia; **C** spores. Habit and T/S sketch, bar = 10 mm; microcharacters, bar = 10 μ m.

19. *Hygrocybe roseoflavida* A.M.Young & A.K.Mills, *sp. nov.*

Pileus 9–20 mm, pallido-roseus, convexus, umbilicatus, viscidus, plicato-striatus, ad marginem aequalum vel subcrenulatum. Lamellae decurrentes, pallido-roseae, ad marginem concolores. Stipes 13–20(–40) \times 1–2 μ m, super pallido-roseo-brunneus, flavidus, viscidus, laevis, cylindricus, cavus, ad basim atroflavidum. Sporae (5–)6–7.5 \times 3.5–4.5 μ m, ovoideae vel ellipsoideae vel lacrymoideae, hyalinae, nunquam constrictae. Basidia (17–)23–28(–32) \times 5.5–7 μ m, (2-)4-spora, fibulata. Cystidia nulla. Trama hymenophoralis subregularis vel regularis, fibulata. Epicutis pilei ixocutem formans. Gregaria vel caespitosa in humo sylvestri.

Type: Tasmania. Sandspit Reserve nr Wielangta, 3.vi.1998, A.K.Mills (*hb. Mills 1559*) (holotype HO 509000)

Pileus 9–20 mm, pallid pink (6A2) but often with brownish tints, convex becoming depressed at the centre or umbilicate and finally more or less plane but remaining centrally depressed, plicate-striate but otherwise smooth, viscid to glutinous, margin even to slightly crenulate. *Lamellae* decurrent, pallid pink (13–14A2 or similar to the pileus with brownish tints), distant, without a glutinous thread to the margins, margins even and concolorous. *Stipe* 13–20(–40) \times 1–2 mm, pallid pinkish brown (6A2–9A2 or similar to pileus) near the lamellae then becoming pale yellow (2A3) and darker towards the base, viscid to glutinous, cylindrical but sometimes a little inflated at the base, hollow.

Spores (5–)6–7.5 \times 3.5–4.5 μ m, mean 7.0 \times 3.9 μ m, Q: 1.4–2.0(–2.2), mean Q: 1.79, ovoid to ellipsoid or lacrymoid, hyaline, smooth, non-constricted. *Basidia* (17–)23–28(–32) \times 5.5–7 μ m, mean 24.4 \times 6.4 μ m, Q: (2.5–)3.5–4.4(–4.7), mean Q: 3.82, (2-)4-spored, clamped. Cystidia none. *Hymenophoral trama* regular to sub-regular, composed of hyaline, inflated, thin-walled elements (17–)30–60(–90) \times 7–30 μ m, clamp connections abundant to occasional. *Pileipellis* an ixocutis of gelatinised, hyaline, thin walled repent hyphae 1.5–7 μ m, clamp connections abundant. *Stiptipellis* an ixocutis of

hyaline, repent, septate, thin-walled hyphae 2.5–6.0 μm , clamp connections present on smaller hyphae (< 4 μm diameter) but absent from larger hyphae. (Fig. 3)

Habitat and distribution: gregarious to caespitose on humus rich soil amongst moss and tree fern debris in rainforest gully, often on the bases of old tree ferns in cool temperate rainforest. This species is so far only known from locations in south-eastern Tasmania.

Material: Johns Rd nr Geeveston, 19.v.1998, A.M.Young (*hb. Young 2045*; BRI); Mt Wellington, 28.iv.98, A.M.Young (*hb. Young 1969*; MEL 2090260); Tasman Peninsula, 25.v.1999, A.K.Mills (*hb. Young 2258*; MEL 2090266); Sandspit Forest Reserve nr Wielangta, 3.vi.1998, A.K.Mills (*hb. Mills 1559*; holotype HO 509000); Sandspit Forest Reserve nr Wielangta, 14.vii.1998, A.K.Mills (*hb. Mills 1585*; HO 509009).

Remarks: This often tiny, glutinous taxon is rather interesting for its unique colouration of pallid pink or pinkish brown pileus and lamellae but with contrasting yellow stipe. The basidia are also unusual in that they are amongst the smallest in the Hygrophoraceae. No other taxon has these colour characteristics coupled with the very small basidia. It is quite difficult to obtain good representative collections of this species as only a very few basidiomes are normally found at each location.

20. *Hygrocybe stevensoniae* T.W.May & A.E.Wood, *Mycotaxon* 54: 148 (1995). *Hygrophorus viridis* G.Stev., *Kew Bull.* 16: 383 (1963); *Gliophorus viridis* (G.Stev.) E.Horak, *Beih. Nova Hedwigia* 43: 173 (1973); *non Hygrocybe viridis* Capelari & Maziero, *Mycotaxon* 33: 192 (1988). *Type:* New Zealand. Levin, 26.vi.1948, G. Stevenson 338 (holotype K).

Misapplied: *Hygrophorus psittacinus* sensu Cleland and Cheel (1919) and Willis (1963); *Hygrocybe psittacina* sensu Shepherd and Totterdell (1988).

Illustrations: Fuhrer & Robinson (1992), p. 41; Young & Wood (1997), p. 998.

Habitat and distribution: solitary to gregarious in cool temperate rainforest amongst moss or humus. The species is widely distributed but does not appear to be as common as the very similar glutinous taxon, *Hygrocybe graminicolor*.

Material: Arve Loop Rd nr Geeveston, 11.v.1998, A.K.Mills (*hb. Mills 1540*; HO 508997); Sandspit Forest Reserve nr Wielangta, 14.vii.1998, A.K.Mills (*hb. Mills 1582*; HO 509006); Sandspit Forest Reserve nr Wielangta, 14.vii.1998, A.K.Mills (*hb. Mills 1583*; HO 509007); Jacksons Bend, 14.x.1998, A.K.Mills (*hb. Mills 1601*; HO 509011).

Remarks: This taxon is presently accepted as occurring in Tasmania, but material from both Australia and New Zealand requires further study. The four collections cited here exhibit macrocharacters consistent with the holotype as follows: all display glutinous basidiomes with a well developed ixotrichoderm on the pileus, the lamellae have fertile margins (there is no glutinous thread with embedded hyphal cheilocystidia) and the lamellae are adnate or at most have a decurrent tooth. The spores in all four collections are ellipsoidal and measure 7–9(–10) \times 4–5.5(–6) μm , means 7.3–8.0 \times 4.4–4.9 μm , Q: 1.4–1.8, mean Q: 1.62–1.66. This also compares quite well with the holotype which has the same macrocharacters and in which the spores measure 6.5–9(–10) \times 4–6.5 μm , mean 8.0 \times 4.9 μm , Q: 1.4–1.8 (–2.1), mean Q: 1.63.

The basidial lengths of Tasmanian material [42–64(–70) \times 5–8(–9) μm , mean 47.6–57.5 \times 6.8–7.8 μm , Q: 5.7–9.6, mean Q: 6.98–7.66] differ consistently from the holotype collection which contains basidia measuring 35–45 \times 6–7.5 μm , mean 38.9 \times 6.1 μm , Q: 4.7–7.0(–9), mean Q: 6.35. The larger basidia found in Tasmanian collections are also known from several collections accepted as *Hygrocybe stevensoniae* from the Blue Mountains, NSW which had basidia measuring 42–56 \times 5–8 μm , mean 46.8–51.8 \times 6.8–7.5 μm , Q: 5.4–10, mean Q: 6.21–7.12. These collections had basidiomes which exhibited the usual macrocharacters of the species and which had spores agreeing with

the dimension range exhibited by the spores of the holotype. The longer basidia of the Tasmanian material are therefore not considered to be important.

Two Tasmanian collections (*hb. Mills 1582, 1583*) showed a colour variations in which pinkish tones predominated. Whether this was due to rain wash, bacterial infection or genetic variation is unknown, however all four collections cited here dried to the usual brick-pink colour exhibited by herbarium material of this taxon.

Subgenus 4 *Humidicutis* Singer, *Sydowia* 2: 28 (1948). *Typical species: Hygrophorus marginatus* Peck.

Basidiome variously coloured white, pink, dull orange, yellow, or lilac; *pileus* usually conical becoming umbonate or plane and frequently splitting radially; *lamellae* narrowly adnate, adnexed or more or less free; *cystidia* absent; *hymenophoral trama* regular, composed of short, cylindrical to inflated (often moniliform) elements 20–300 µm long; *clamp connections* absent throughout the basidiome except at the bases of the basidia and then frequently of medallion form.

21. *Hygrocybe lewelliniae* (Kalchbr.) Brittleb. *ex* A.M.Young in Young & Wood, *Austral. Syst. Bot.* 10: 1011 (1997); *Hygrophorus lewelliniae* Kalchbr., *Proc. Linn. Soc. New South Wales* 7: 105 (1882). *Type*: Victoria. Western Port, 14.vi.1880, *M.M.R.Lewellin* (holotype Rare Book Mss A11, MEL).

Uncertain recombination: Brittlebank, *Cat. Austral. Fungi* 181 (1940).

Illustrations: Willis (1957); Cole, Fuhrer & Holland (1978), plate 3.

Habitat and distribution: often solitary but occasionally gregarious, usually amongst moss but occasionally in humus in cool temperate rainforest. *Hygrocybe lewelliniae* is common and widespread in southern, central and north-western Tasmania.

Material: Arve Loop Rd nr Geeveston, 27.iv.1998, *A.M.Young* (*hb. Young 1965*; BRI); Mt Field, 30.iv.1998, *A.M.Young* (*hb. Young 1976*; BRI); Lake Chisholm, 6.v.1998, *A.M.Young* (*hb. Young 1999*; BRI); MICH 28502); Franklin R., 7.v.1998, *A.M.Young* (*hb. Young 2003*; BRI); Little Florentine R., 13.v.1998, *A.M.Young* (*hb. Young 2021*; BRI); Franklin R., 21.v.1999, *A.M.Young* (*hb. Young 2246*; BRI); Arve Loop Rd nr Geeveston, 11.v.1998, *A.M.Young* (*hb. Young 2017*; MEL 2088599); Little Florentine R., 13.v.1998, *A.M.Young* (*hb. Young 2022*; MEL 2088602); Johns Rd nr Geeveston, 19.v.1998, *A.M.Young* (*hb. Young 2047*; MEL 2088607); Tahune, 17.v.1999, *A.M.Young* (*hb. Young 2212*; MEL 2088609); Franklin R., 21.v.1999, *A.M.Young* (*hb. Young 2242*; MEL 2088612); Rutherfords Rd nr Geeveston, 18.vi.1998, *A.K.Mills* (*hb. Mills 1579*; HO 509004).

Remarks: Colour variations of *Hygrocybe lewelliniae* include very pale lilac to nearly deep violet but all collections have shown the same microscopic characters as those of the holotype. Macroscopically, all collections have displayed the conical to umbonate, dry pilei with radial splitting that creates a medial split along the trama in the lamella directly beneath the split in the pileus so that each lamella half remains attached both to the pileus and along the lamella margin. The recombination by Brittlebank (1940) remains doubtful due to uncertainties with respect to effective means of publication and so the paper by Young and Wood (1997) is used to validate Brittlebank's recombination.

22. *Hygrocybe mavis* (G.Stev.) E.Horak, *New Zealand J. Bot.* 9: 434 (1971); *Hygrophorus mavis* G.Stev., *Kew Bull.* 16: 377 (1962). *Type*: New Zealand. Levin, 18.vi.1949, *G. Stevenson, Stevenson 654* (holotype K).

Misappl.: *Hygrophorus purus* Peck, sensu E.Horak, *New Zealand J. Bot.* 28: 294 (1990).

Illustration: Young & Wood (1997), p. 1016.

Habitat and distribution: generally solitary but occasionally gregarious and occurring in moss or on soil or amongst humus in cool temperate rainforest. This species is frequent and widespread in southern, central and north-western Tasmania.

Material: Mt Field, 30.iv.1998, A.M.Young (*hb. Young 1971*; BRI); Lake Chisholm, 6.v.1998, A.M.Young (*hb. Young 1998*; BRI); Johns Rd nr Geeveston, 19.v.1998, A.M.Young (*hb. Young 2044*; BRI); Little Florentine R., 26.v.1999, A.M.Young (*hb. Young 2265*; BRI); Milkshake Res., 6.v.1998, A.M.Young (*hb. Young 1994*; MEL 2088593); Little Florentine R., 13.v.1998, A.M.Young (*hb. Young 2028*; MEL 2088604); Tasman Peninsula, A.K.Mills & A.M.Young (*hb. Young 2249*; MEL 2088613); Sandspit Forest Res. nr Wielangta, 14.vii.1998, A.K.Mills (*hb. Mills 1584*; HO 509008); Julius R nr Smithton, 9.iv.1991, E.Horak (ZT 4854; BRI).

Remarks: *Hygrocybe mavis* shares with *H. lewellinae* the remarkable characteristic in which there is combined splitting of both the pileus and lamellae. Whether *H. mavis* is the white variety of *H. lewellinae* remains to be resolved. The characters of Tasmanian material conform well with those of the holotype.

Genus 2. *Camarophyllopsis* Herink, *Sborn. Severoesk. Mus., Přir. Vdy* 1: 61 (1958).
Typical species: *Camarophyllopsis schulzeri* (Bres.) Herink.

Basidiome thin to fleshy, small, dull coloured in grey to ochre or brown; *pileus* convex to umbilicate, dry and often hygrophanous; *lamellae* distant, broadly adnate to arcuate or decurrent; universal veil absent; *stipe* dry, often with small dots or pruinose punctate; spore print white. *Spores* hyaline, smooth, non-amyloid, subglobose to broadly ellipsoid, small (up to 7 µm long); *basidia* narrowly clavate, 20–70 × 4.5–8.5 µm, Q: 4.5–10.0, mostly 4-spored; cystidia absent or inconspicuous; *hymenophoral trama* regular to sub-regular and composed of short elements up to 170 µm long; *pileipellis* an hymeniderm; *clamp connections* present or absent; development monovelangiocarpic and stipiticarpic. Solitary to subgregarious, terrestrial in forests or open sites, apparently saprophytic. Mostly in temperate North America, Asia and Europe, but also known from subtropical South America and Asia.

23. *Camarophyllopsis kearneyi* A.M.Young, *Austrobaileya* 5: 562 (1999). *Type:* New South Wales. Lane Cove Bushland Park, 13.vi.1998, R. & E.Kearney s.n. (holotype DAR 73919).

Illustration: Young (1999), p. 563.

Habitat and distribution: gregarious to caespitose on soil or deep humus or amongst moss in very sheltered parts of cool temperate rainforest. The two Tasmanian collections come from nearby locations in the south east region.

Material: Growlingswallet nr Mt Field, 19.v.1999, A.M.Young (*hb. Young 2236*; MEL 2089735); Little Florentine R., 26.v.1999, A.M.Young (*hb. Young 2269*; MEL 2089736).

Remarks: These two collections conform macroscopically extremely well to the type collection from Lane Cove Bushland Park. Both Tasmanian collections were made in very sheltered locations and the material in *hb. Young 2269* was collected under old tree ferns in very dense shade. The Growlingswallet collection consisted of basidiomes growing gregariously but the second collection had a number of basidiomes additionally displaying a caespitose habit. Spore sizes from the two collections were 4.5–6 × 4.5–5.5 µm, mean 5.4 × 5.2 µm, Q: 0.9–1.2, mean Q: 1.05, and 4.5–6.5 × 4–5.5 µm, mean 5.2 × 4.7 µm, Q: 1.0–1.3, mean Q: 1.10 respectively. This compares well with the holotype which has spores measuring (4 –)4.3–5.7 × 4.0–5.3(–5.7) µm, mean 4.9 × 4.6 µm, Q: 1.0–1.2(–1.3), mean Q: 1.1. The basidial ranges similarly overlap and variations are not considered important.

The presence and structure of cheilocystidia reported from the holotype appears to vary and is now in need of further clarification. At the time of publication, only material collected from the type location was known and possible character ranges were therefore limited to those exhibited by the holotype. The two Tasmanian collections do contain lamellae elements that appear to be identical to the cheilocystidia of the holotype, however these elements may be partially or wholly hidden within the marginal structure of the lamellae. The Tasmanian collections indicate that this type of variation may be normal for the species and is now being encountered for the first time. In addition, the cheilocystidia often resemble immature basidia/basidioles and the 'fine line' between cheilocystidia and immature reproductive elements is now being considered. Further mature and immature collections of this taxon are required to determine whether the cheilocystidia reported from the holotype are either a variable character or an artifact of the basidiome age/maturity. *Hygrocybe miniata* (Arnolds 1990; Boertmann 1995) is another taxon in which various collections may or may not exhibit the presence of cheilocystidial elements.

TRIBE 2. HYGROPHOREAE P. Henn. in Engl. & Prantl, *Nat. Pflanzenfam.* 1: 209 (1898). *emend.* Kühner in *Bull. mens. Soc. linn. Lyon* 48: 617 (1979). *Type genus:* *Hygrophorus* Fr., *Gen. Hymenomyc.*: 8 (1836).

Hymenophoral trama divergent; forming ectomycorrhizae.

Genus 1. *Hygrophorus* Fr., *Gen. Hymenomyc.* 8 (1836). *Typical species:* *Hygrophorus eburneus* (Bull.: Fr.) Fr.

Basidiome tricholomatoid to omphaloid, fleshy to thin, small to large; *pileus* variously coloured but usually of dull colours, not hygrophanous, mostly viscid to glutinous; *lamellae* spaced to distant, broadly adnate to decurrent, thick, waxy; *universal veil* often present and glutinous; *partial veil* sometimes present; *stipe* often glutinous or viscid, frequently with small dots punctate at the apex; *spore print* white. *Spores* hyaline, smooth, non-amyloid, *basidia* narrowly clavate, 30–90 × 6–15 µm, Q: 4.5–9.0; *cystidia* absent or inconspicuous; *hymenophoral trama* divergent from a central line and made of short elements up to 200 µm long; *pileipellis* mostly an ixocutis or an ixotrichoderm, rarely a cutis or trichoderm; *clamp connections* present; development gymnocarpic to pseudoangiocarpic and stipitocarpic. Solitary to gregarious, terrestrial, always near trees or shrubs and apparently ectomycorrhizal principally with Pinaceae, Betulaceae and Fagaceae. Mostly in temperate zones of the Northern Hemisphere, but some taxa in similar climatic regions of Southern Hemisphere.

One species known for Tasmania.

24. *Hygrophorus involutus* G.Stev., *Kew Bull.* 16: 373 (1962). *Type:* New Zealand. Butterfly, 2.vi.1958, G. Stevenson (*Stevenson 1347*) (holotype K).

Pileus convex, white, yellow or apricot-yellow, viscid; trichoderm present; stipe concolorous with pileus.

Key to varieties of *Hygrophorus involutus*

1. Pileus, lamellae and stipe pure white **24a. var. *albus***
1. Pileus, lamellae and stipe shades of creamish yellow to apricot-yellow **24b. var. *involutus***

24a. *Hygrophorus involutus* G.Stev. var. *albus* A.M.Young & A.K.Mills, var. nov.
A *H. involutus* basidiomatibus albis differt.

Type: Tasmania. Arve Loop Rd nr Geeveston, A.K.Mills (*hb. Mills: 1541*) (holotype HO 508602; isotype *hb.Mills.*)

Illustration: Fuhrer & Robinson (1992), p. 39 as *Camarophyllus niveus*.

Basidiomes wholly pure white but otherwise identical to those of var. *involutus*.

Habitat and distribution: gregarious amongst soil, humus or moss in cool temperate rainforest. The variety is reasonably common and often appears amongst normally coloured basidiomes.

Material: Myrtle Forest Track nr Collinsvale, 18.iii.1999, G.Gates (*hb. Mills 1628*; HO 508614).

Remarks: The pure white basidiomes of *Hygrophorus involutus* var. *albus* differ from the normal light orange to yellowish basidiomes of *H. involutus* var. *involutus* only in that they are without any coloured pigments. Only two collections are here listed, however anecdotal evidence indicates that this white variety is widespread in suitable Tasmanian habitats.

24b. *Hygrophorus involutus* G.Stev. var. *involutus*

Illustrations: Fuhrer & Robinson (1992), p. 45; Young & Wood (1997), p. 1020.

Habitat and distribution: gregarious amongst soil, humus or moss in cool temperate rainforest. This species is widespread and common in southern, central and north-western Tasmania.

Material: Arve Loop Rd nr Geeveston, 27.iv.1998, A.M.Young (*hb. Young 1958*; MEL 2087781); Mt Field, 30.iv.1998, A.M.Young (*hb. Young 1972*; BRI); Little Florentine River, 13.v.1998, A.M.Young (*hb. Young 2040*; BRI); Growlingswallet nr Mt Field, 19.v.1999, A.M.Young (*hb. Young 2233*; MEL 2087770); Arve Loop Rd nr Geeveston, 11.v.1998, A.K.Mills (*hb. Mills 1542*; HO 508603); Arve Loop Rd nr Geeveston, 11.v.1998, A.K.Mills (*hb. Mills 1544*; HO 508604); Sandspit Forest Reserve nr Wielangta, A.K.Mills (*hb. Mills 1588*; HO 508607); Myrtle Forest Track nr Collinsvale, G.Gates (*hb. Mills 1627*; HO 508613); Franklin R., 13.iv.1991, E.Horak (ZT 4317; BRI).

Remarks: *Hygrophorus involutus* remains the sole representative of the genus for Australia. Collection *hb. Young 2040* was used to confirm previous remarks in Young (2000a) regarding the weakly divergent trama. Inspection has shown that the divergent structure is best observed if the section is taken from the larger lamellae of older pilei and at a point about one third of the distance of the pileus radius commencing at the margin. The divergent hyphae can be seen in the middle part of the lamellae.

Several Tasmanian collections exhibit basidiomes which have smaller mean spore sizes and Q's ($5.5\text{--}7.5 \times 3.5\text{--}4.5 \mu\text{m}$, mean $6.5 \times 4.2 \mu\text{m}$, Q: 1.3–1.8, mean Q: 1.55) than those previously reported (Young & Wood 1997) from mainland material ($6.0\text{--}7.5\text{--}(9) \times (3\text{--})3.5\text{--}4.5\text{--}(5) \mu\text{m}$, mean $7.2 \times 3.9 \mu\text{m}$, Q: 1.4–2.3, mean Q: 1.9). However, because there is so much overlap of dimensions and since all other aspects of the basidiomes are similar, the difference is considered to be normal species variation.

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